Final
Determination of Compliance

Pittsburg District Energy Facility, LLC

Bay Area Air Quality Management District
Application 18595

June 10, 1999

Dennis Jang, P.E.
Air Quality Engineer

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I Introduction

This is the Final Determination of Compliance (FDOC) for the Pittsburg District Energy Facility, LLC (PDEF), a nominal 520 MW, natural gas fired, combined cycle merchant power plant proposed by Enron Capital & Trade Resources Group. The power plant will be located near the intersection of East 3rd Street and Columbia in the city of Pittsburg and will have two possible configurations:

- two natural-gas fired, F-class turbines (each 170 MW) with associated heat recovery steam generators (each 90 MW), one common steam turbine, and one auxiliary boiler (1 X 1 Configuration)

- two natural-gas fired, F-class turbines (each 170 MW) with associated heat recovery steam generators (each 90 MW), each with a dedicated steam turbine, and one auxiliary boiler (2 X 1 Configuration)

This FDOC was prepared by the staff of the Bay Area Air Quality Management District in accordance with District Regulation 2, Rule 3, Section 403. The FDOC describes how the proposed facility will comply with applicable federal, state, and BAAQMD regulations, including the Best Available Control Technology and emission offset requirements of New Source Review. Permit conditions necessary to insure compliance with applicable regulations are also included. Pursuant to Regulation 2-3-405, the District will issue the Authority to Construct for the PDEF after the CEC issues the Certificate for the facility.

A. Background

Pursuant to BAAQMD Regulation 2, Rule 3, Section 403, this document serves as the Final Determination of Compliance review. It will also serve as the evaluation report for the District Authority to Construct application #18595. Pursuant to Regulation 2, Rule 3, Section 404, the FDOC has fullfilled the public notice, public inspection, and 30-day public comment period requirements of District Regulation 2, Rule 2, Sections 406 and 407.

B. Project Description

1. Process Equipment

The applicant is proposing a combined-cycle cogeneration facility capable of producing a nominal electrical output of 520 MW and 75,000 pounds per hour of process steam. The primary steam customer will be USS POSCO Industries. The Pittsburg District Energy Facility will consist of the following permitted equipment:

S-1 Combustion Gas Turbine #1, General Electric Frame 7FA Model PG 7231 or equivalent; 1,929 MM BTU per hour, equipped with dry low-NO_x Combustors, abated by A-1 Selective Catalytic Reduction System and A-2 Oxidation Catalyst

S-2 Heat Recovery Steam Generator #1, equipped with dry low-NO_x Duct Burners, 83 MM BTU per hour, abated by A-1 Selective Catalytic Reduction System and A-2 Oxidation Catalyst.

S-3 Combustion Gas Turbine #2, General Electric Frame 7FA Model PG 7231 or equivalent; 1,929 MM BTU per hour, equipped with dry low-NO_x Combustors, abated by A-3 Selective Catalytic Reduction System and A-4 Oxidation Catalyst

S-4 Heat Recovery Steam Generator #2, equipped with dry low-NO_x Duct Burners, 83 MM BTU per hour, abated by A-3 Selective Catalytic Reduction System and A-4 Oxidation Catalyst.

S-5 Auxiliary Steam Boiler, 266 MM BTU per hour, equipped with low-NO_x burners

As stated earlier, the Pittsburg District Energy Facility will have two possible configurations:

- two natural-gas fired F-class turbines with associated heat recovery steam generators, one common steam turbine, and one auxiliary boiler (1 X 1 Configuration)

- two natural-gas fired F-class turbines with associated heat recovery steam generators, each with a dedicated steam turbine, and one auxiliary boiler (2 X 1 Configuration)

In both configurations, each natural gas fired combustion turbine generator (CTG) will have a nominal electrical output of 170 MW and each heat recovery steam generator (HRSG) will have a nominal electrical output of 90 MW. The maximum combined heat input for each CTG/HRSG power train will be 2,012 MM BTU/hr. The gas turbines and steam turbine(s) will each drive separate generators.

The facility will also include a six-cell cooling tower that is exempt from District permit requirements pursuant to Regulation 2-1-128.4 since it will not be used for the evaporative cooling of process water.

2. Air Pollution Control Equipment

The proposed facility includes sources that trigger the Best Available Control Technology (BACT) requirement of New Source Review (District Regulation 2, Rule 2, NSR) for emissions of nitrogen oxides (NO_x), carbon monoxide (CO), precursor organic compounds (POCs), sulfur dioxide (SO_2), and particulate matter of less than 10 microns in diameter (PM_{10}).

a. Selective Catalytic Reduction with Ammonia Injection for the Control of NO_x

The combustion turbine generator, HRSG duct burners, and auxiliary boiler each trigger BACT for NO_x emissions. The gas turbines and HRSG will be equipped with dry low-NO_x (DLN) combustors, which are designed to minimize NO_x emissions. In addition, the NO_x emissions will be further reduced through the use of abatement equipment in the form of selective catalytic reduction (SCR) with ammonia injection. The auxiliary boiler will be equipped with low-NO_x burners to minimize NO_x emissions.

b. Oxidation Catalyst for the Control of CO Emissions

The combustion turbine generator, HRSG duct burners, and auxiliary boiler each trigger BACT for CO emissions. The combustion turbines and HRSGs will be equipped with dry low-NO_x combustors, which are also designed to minimize CO emissions. These CO emissions will be further reduced through the use of an oxidation catalyst. Good combustion practices will be utilized to reduce CO emissions from the auxiliary boiler.

c. Low-NO_x Burners and Oxidation Catalyst to minimize POC Emissions

The CTGs and HRSGs each trigger BACT for POC emissions. Each source will utilize low-NO_x burners, which are designed to minimize incomplete combustion and therefore minimize POC emissions. The oxidation catalyst is expected to achieve a POC conversion efficiency of 30% by weight. Together with the use of good combustion practices, each CTG is expected to achieve a BACT-level POC emission rate of 0.00136 lb/MM BTU and the HRSG is expected to achieve a BACT-level POC emission rate of 0.01 lb/MM BTU. When operating simultaneously, the CTG and HRSG are expected to achieve a combined POC emission rate of 0.0017 lb/MM BTU.

d. Exclusive Use of a "Clean" Fuel to Minimize SO_2 and PM_{10} Emissions

The combustion turbine generator, HRSG duct burners, and auxiliary boiler will utilize natural gas exclusively to minimize SO_2 and PM_{10} emissions. Because the emission rate of SO_2 depends on the sulfur content of the fuel burned and is not dependent upon the burner type or other combustion characteristics, the use of natural gas will result in the lowest possible emission of SO_2. PM_{10} emissions are minimized through the use of best combustion practices and "clean burning" natural gas.

II Project Emissions

The facility criteria pollutant emissions and toxic air contaminant emissions are presented in the following tables. Detailed emission calculations, including the derivations of emission factors are presented in the appendices.

Table 1 is a summary of maximum facility regulated air pollutant emissions. The total emissions in tons per year are used to determine if the Prevention of Significant Deterioration (PSD) requirement of New Source Review (Regulation 2-2-304) has been triggered for each pollutant.

Table 2 is a summary of the maximum facility toxic air contaminant (TAC) emissions. These emissions are used as input data for air pollutant dispersion models used to assess the increased health risk to the public resulting from the project. The ammonia emissions shown are based upon a worst-case ammonia emission concentration of 10 ppmvd @ 15% O_2 due to ammonia slip from the A-1 and A-2 SCR Systems.

Table 3 is a summary of the daily maximum regulated air pollutant emissions for each permitted source, including the combustion turbine generators (CTGs), the heat recovery steam generators (HRSGs), and the auxiliary boiler. These emissions are used to determine if the Best Available Control Technology (BACT) requirement of Regulation 2, Rule 2 New Source Review (NSR) is triggered on a pollutant-specific basis. Pursuant to Regulation 2-2-301.1, any new source that will result in POC, NPOC, NO_x, SO_2, PM_{10}, or CO emissions in excess of 10 pounds per highest day per pollutant are subject to the BACT requirement.

Table 1 Maximum Facility Regulated Air Pollutant Emissions[a]

Pollutant	pounds/hour[b]	Pounds/day[b]	Tons/year[c]
Nitrogen Oxides (as NO_2)	39.05	939.5	154.8
Carbon Monoxide	62.8	1507.8	488.1
Precursor Organic Compounds	7.13	173.4	97.61
Particulate Matter (PM_{10})	35.77	858.4	123.6
Sulfur Dioxide	11.86	284.7	39.86

[a]Includes emissions from permitted and exempt sources

[b]Includes only combined CTG and HRSG baseload emissions (i.e. excluding CTG startup and shutdown emissions) based upon 24 hour per day operation

[c]Includes start-up and shutdown emissions for CTG (312 total hot start-ups and 312 total shutdowns per year for both turbines combined)

Table 2
Maximum Facility Toxic Air Contaminant (TAC) Emissions

Contaminant	pounds/year	Risk Screening Trigger Level[a] (lb/yr)
S-1, S-2, S-3, S-4, & S-5[b]		
Acetaldehyde[d]	2,266	72
Acrolein	768	3.9
Ammonia[c]	396,670	19,300
Benzene[d]	430	6.7
1,3-Butadiene[d]	4.1	1.1
Ethylbenzene	582.5	193,000
Formaldehyde[d]	3,643.3	33
Hexane	8,428	83,000
Napthalene	54.3	270
PAHs[d]	75.3	0.043
Propylene	25,110	N/S
Propylene Oxide[d]	1,535.2	52
Toluene	2,346.3	38,600
Xylene	891	57,900
Cooling Tower Emissions		
Aluminum	0.39	N/S[e]
Arsenic[d]	0.016	0.024
Silver	0.02	N/S
Barium	0.05	N/S
Beryllium[d]	0.04	0.015
Cadmium[d]	0.04	0.046
Chloride	900	N/S
Hexavalent chromium[d]	0.02	0.0014
Copper	0.028	463
Fluoride	2.8	N/S
Lead[d]	0.087	29
Magnesium	105	N/S
Manganese	0.53	77
Mercury	0.0008	57.9
Selenium[d]	0.028	96.5
Silica[d]	0.11	N/S
Sodium hydroxide	0.028	926
Sulfate	771	N/S
Zinc	0.05	6,760

[a]pursuant to District Toxic Risk Management Policy
[b]combined TAC emissions from S-1 & S-3 CTGs, S-2 & S-4 HRSGs, and S-5 Auxiliary Boiler

[c]based upon the worst-case ammonia slip from the A-1 and A-2 SCR systems of 10 ppmvd @ 15% O_2 and 8,080 hours of operation per CTG at 100% load

[d]carcinogenic compound

[e]none specified

Table 3
Daily Maximum Regulated Air Pollutant Emissions by Source (lb/day)

Pollutant	Source		
	S-1 CTG & S-2 HRSG[a]	S-3 CTG & S-4 HRSG[a]	S-5 Auxiliary Boiler[b]
Nitrogen Oxides (as NO_2)	688.4	688.4	68.3
Carbon Monoxide	2656.5	2656.5	233
Precursor Organic Compounds	551.17	551.17	8.75
Particulate Matter (PM_{10})	408	408	31.9
Sulfur Dioxide	133.76	133.76	17.2

[a]Based upon one 1 hour hot startup, 22.5 hours of CTG/HRSG operation at maximum firing rate of 2,012 MM BTU/hr, and one 0.5 hour shutdown in one day

[b]Based upon 24 hour per day operation of the auxiliary boiler at its maximum firing rate of 266 MM BTU/hr

III Statement of Compliance

The following section summarizes the applicable District Rules and Regulations and describes how the proposed project will comply with those requirements.

A. Regulation 2, Rule 2; New Source Review

The primary requirements of New Source Review that apply to the PDEF project are Section 2-2-301; “Best Available Control Technology Requirement”, Section 2-2-302; “Offset

Requirements, Precursor Organic Compounds and Nitrogen Oxides, NSR", and Section 2-2-303; "Offset Requirement, PM10 and Sulfur Dioxide, NSR" and Section 2-2-404, "PSD Air Quality Analysis".

1. Best Available Control Technology (BACT) Determinations

Pursuant to Regulation 2-2-206, BACT is defined as the more stringent of:

a) "The most effective control device or technique which has been successfully utilized for the type of equipment comprising such a source; or

(b) The most stringent emission limitation achieved by an emission control device or technique for the type of equipment comprising such a source: or

(c) Any emission control device or technique determined to be technologically feasible and cost-effective by the APCO, or

(d) The most effective emission control limitation for the type of equipment comprising such a source which the EPA states, prior to or during the public comment period, is contained in an approved implementation plan of any state, unless the applicant demonstrates to the satisfaction of the APCO that such limitations are not achievable. Under no circumstances shall the emission control required be less stringent than the emission control required by any applicable provision of federal, state or District laws, rules or regulations."

The type of BACT described in definitions (a) and (b) must have been demonstrated in practice and approved by a local Air Pollution Control District, CARB, or the EPA. This type of BACT is termed "achieved in practice". The type of BACT described in definition (c) must have been demonstrated to be effective and reliable on a full-scale unit **and** shown to be cost-effective on the basis of dollars per ton of pollutant abated. This type of BACT is referred to as "technologically feasible/cost-effective".

BACT specifications (for both the "achieved in practice" and "technologically feasible/cost-effective" categories) for various source categories has been compiled in the BAAQMD BACT Guideline. The following section includes BACT determinations by pollutant for the permitted sources of the proposed Pittsburg District Energy Facility. Because each CTG and the associated HRSG duct burners will exhaust through common stacks and be subject to combined emission limitations, the BACT determinations will apply to each CTG and HRSG power train as a combined unit.

In accordance with current District policy, all emission concentration limits are averaged over any consecutive three-hour period. This averaging period will allow for a well considered operator response to normal operational excursions while insuring compliance with BACT standards on a continual basis. Furthermore, pollutant mass emission limits (in both lb/hr and lb/MM BTU of natural gas fired) will insure that daily and annual emission rate limitations are not exceeded.

Nitrogen Oxides (NO_x)

- Combustion Turbine Generators (CTGs):

  District BACT Guideline 89.2.1 specifies BACT (achieved in practice) for NO_x for a gas turbine with a rated heat input $\geq$ 23 MM BTU per hour as NO_x emissions < 5 ppmvd @ 15% O_2, achieved through the use of Selective Catalytic Reduction (SCR) with ammonia injection in conjunction with combustion modifications. The SCAQMD BACT Guideline for gas turbines $\geq$ 3 MW specifies BACT for NO_x as 2.5 ppmvd, @ 15% O_2 with an efficiency correction factor and an assumed averaging period of one hour. This BACT determination was based upon the demonstration of a SCONOX system on a 32 MW combined cycle, baseload turbine currently in operation in Vernon, California. The EPA has accepted this BACT determination as Federal LAER and further established a NO_x concentration of 2.0 ppmvd @ 15% O_2 averaged over three hours as equivalent to 2.5 ppmvd, @ 15% O_2 averaged over one hour.

  In response to comments from the ARB and EPA, the applicant has agreed to a NO_x emission concentration limit of 2.5 ppmvd NO_x @ 15% O_2 averaged over one hour with allowance for excursions from the 1-hour standard caused by transient, non-steady state operating conditions. The condition allows for a 24 month period to evaluate the transient conditions (if any) under which excursions from the 1-hour standard may occur. During this 24-month test period, the applicant will also develop procedures and/or effect modifications to the turbine/HRSG systems to insure on-going compliance with the 1-hour standard. The EPA and ARB have agreed to the "allowable excursion" language in permit condition #22 as shown in this FDOC.

- Heat Recovery Steam Generator (HRSG)

  Supplemental heat will be supplied to the HRSGs with dry, low-NO_x burners, which are designed to minimize NO_x emissions. The duct burner emissions will also be abated by the SCR system with ammonia injection mentioned above and when combined with the CTG exhaust, will achieve NO_x emissions of 2.5 ppmvd @ 15% O_2 averaged over one hour.

- Auxiliary Boiler

  District BACT Guideline 17.3.1 specifies BACT (achieved in practice) for NO_x for a boiler with a rated heat input $\geq$ 50 MM BTU/hr as a NO_x emission concentration of 9 ppmvd @ 3% O_2. The proposed boiler is expected to achieve this NO_x emission level through the use of dry low-NO_x burners.

Carbon Monoxide (CO)

- Combustion Turbine Generator (CTG):

  District BACT Guideline 89.2.1 specifies BACT (achieved in practice) for CO for gas turbines with a rated heat input $\geq$ 23 MM BTU per hour as a CO emission concentration of 10 ppmvd @ 15% O_2. BACT (technologically feasible/cost-effective) is specified as a CO emission concentration of < 6 ppmvd @ 15% O_2.

  The applicant has proposed a controlled CO emission level of 6.0 ppmvd @ 15% O_2 which will be achieved through the use of dry low-NO_x burners which minimize incomplete combustion and an oxidation catalyst. Each CTG/HRSG power train will be conditioned to a combined CO emission limit of 6.0 ppmvd @ 15% O_2, averaged over any consecutive three hour period after abatement by the oxidation catalyst.

- Heat Recovery Steam Generator (HRSG)

  The HRSG will be equipped with dry, low-NO_x burners which will minimize incomplete combustion and thereby minimize CO emissions. Through the use of the same catalytic oxidation system mentioned above, the HRSG exhaust gas, when combined with the CTG exhaust gas, will also achieve a CO emission level of 6.0 ppmvd @ 15% O_2, averaged over any consecutive three hour period.

- Auxiliary Boiler

  With highest-day CO emissions of 233 pounds, S-5 Auxiliary Boiler triggers the BACT requirement of New Source Review (District Regulation 2, Rule 2). BAAQMD BACT Guideline 17.3.1 specifies BACT for CO for boilers with a rated heat input $\geq$ 50 MM BTU/hr as a CO emission concentration of 50 ppmvd @ 3% O_2. The proposed auxiliary boiler will be limited by permit condition to a CO emission concentration of 50 ppmvd @ 3% O_2, averaged over any consecutive three hour period. The boiler will achieve this CO emission level through the use of dry low-NO_x burners and good combustion practices.

Precursor Organic Compounds (POCs)

- Combustion Turbine Generator (CTG):

  District BACT Guideline 89.2.1 specifies BACT for POC for gas turbines with a heat input rating $\geq$ 23 MM BTU per hour as 50% reduction by weight to be achieved through the use of an oxidation catalyst. Because the sampling of the turbine exhaust upstream of the oxidation catalyst is problematic due to exhaust gas flow rate measurement inaccuracy due to the proximity of the HSRG, the verification of the reduction efficiency is not feasible. Because CEMs for organic compounds only measure carbon (as C_1), it is not possible to

determine non-methane/ethane hydrocarbon concentrations on a real-time basis. As a result, a continuous emission concentration limitation as BACT for POC is not feasible. Therefore, BACT for POC is deemed to be the use of an oxidation catalyst together with a POC mass emission rate limitations of 3.43 lb/hour and 0.0017 lb/MM BTU. These limitations are derived from gas turbine, duct burner, and catalyst vendor guarantees obtained by the applicant and apply to the turbines alone and to the combined exhaust from the turbine and duct burners.

- Heat Recovery Steam Generator (HRSG)

  The HRSG duct burners will be of low-NO_x design and therefore minimize incomplete combustion, resulting in a reduced POC emission rate. They will also be abated by an oxidation catatyst. This configuration is deemed BACT for POC emissions from the HRSG duct burners.

- Auxiliary Boiler

  With worst-case daily POC emissions of less than 10 pounds, the auxiliary boiler does not trigger the BACT requirement of New Source Review (District Regulation 2-2-301) for POC.

Sulfur Dioxide (SO_2) and Particulate Matter (PM_{10})

- Combustion Turbine Generator (CTG)

  District BACT Guideline 89.2.1 specifies BACT for SO_2 and PM_{10} for gas turbines with a heat input rating $\geq$ 23 MM BTU per hour as the use of natural gas. The proposed turbine will utilize natural gas exclusively.

- Heat Recovery Steam Generator (HRSG)

  As in the case of the CTG, BACT for SO_2 and PM_{10} for the HRSG duct burners is deemed to be the use of natural gas exclusively.

- Auxiliary Boiler

  As is the case for the CTGs and HRSGs, BACT for SO_2 and PM_{10} for the auxiliary boiler is deemed to be the exclusive use of natural gas as a fuel.

2. Emission Offsets

General Requirements

Pursuant to Regulation 2-2-302, federally enforceable emission offsets are required for POC and NO_x emission increases from permitted sources at facilities which will emit 15 tons per year or more on a pollutant-specific basis. Furthermore, if the facility will emit 50 tons per year or more on a pollutant-specific basis, then offsets must be provided by the applicant at a ratio of 1.15 to 1.0.

Pursuant to Regulation 2-2-303, emission offsets shall be provided (at a ratio of 1.0:1.0) for PM_{10} emission increases at new facilities that will be permitted to emit more than 100 tons of PM_{10} per year. Pursuant to Regulation 2-2-303.1, emission reduction credits of nitrogen oxides or sulfur dioxide may be used to offset PM_{10} emission increases.

Pursuant to District Regulation 2, Rule 2, Section 302, offsets are required only for permitted sources. Therefore, emission offsets will be required for the POC, NO_x, and PM_{10} emission increases associated with S-1 CTG, S-2 HRSG, S-3 CTG, S-4 HRSG, and S-5 Auxiliary Boiler only. Emission offsets will not be required for the PM_{10} emissions attributed to the exempt cooling towers. Please see Appendix C for further detail.

It should be noted that District regulations do not require consideration of the location of the source of the the proposed emission reduction credits relative to the location of emission increases that will be offset.

Timing for Provision of Offsets

In accordance with current BAAQMD Permit Services Division policy and District Regulation 2-2-410, the applicant must demonstrate control of the required quantity of valid emission reduction credits through options contracts or equivalent binding legal documents prior to the issuance of the Authority to Construct. The actual emission reduction credit certificates must be provided to the District prior to the issuance of the Permit to Operate for the new or modified facility. However, in response to a request from the CEC, the provision of the emission reduction credits will be required prior to the start of construction of the PDEF. Pursuant to District Regulation 2, Rule 3, Power Plants, the Authority to Construct will not be issued until the California Energy Commission issues the Certificate for the power plant.

Interpollutant Offset Ratios

Pursuant to District Regulation, 2-2-303.1, an applicant can provide NO_x and/or SO_2 emission reduction credits to offset PM_{10} emission increases at ratios deemed appropriate by the APCO. Pursuant to current District policy, the interpollutant offset ratio for NO_x to PM_{10} is 6.0:1.0 and the ratio for SO_2 to PM_{10} is 4.0: 1.0. These ratios are based upon an interpollutant trade-off

ratio analysis conducted by Systems Applications International for the Shell Refinery located in Martinez, California. The analysis utilized three methods to estimate the amount of secondary PM_{10} formation resulting from the emission of NO_x and SO_2. The first method was based entirely upon an analysis of ambient air quality data. The second method used a photochemical box model to compute the aerosol yield from a unit of NO_x or SO_x emissions. The third method used the photochemical model to simulate the effect of an incremental unit of precursor emissions on typical atmosphere with variable mixing height. Under current policy, if an applicant wishes to utilize different (i.e. lower) interpollutant offset ratios, they must submit an analysis for review.

Offset Requirements by Pollutant

POC Offsets

Because the PDEF will emit greater than 50 tons per year of Precursor Organic Compounds (POCs), the applicant must provide emission reduction credits (ERCs) of POC at a ratio of 1.15 to 1.0 pursuant to District Regulation 2-2-302. The amount of POC offsets due is 123.55 tons per year. Pursuant to District Regulation, 2-2-302.1, the applicant has the option to provide NO_x ERCs to offset the proposed POC emission increases at a ratio of 1.15 to 1.0. Currently, the applicant plans to provide POC emission reduction credits to offset the proposed POC emission increases associated with the PDEF. The POC offsets to be provided by the applicant originate from the change in the method of operation of Quebecor Printing located in San Jose, California. The ERCs were officially banked under Certificate #589 on June 2, 1999. The banking evaluation and review under District application #18791 certified that the credits are real, quantifiable, permanent, and enforceable.

NO_x Offsets

Because the PDEF will emit greater than 50 tons per year of Nitrogen Oxides (NO_x), the applicant must provide emission reduction credits (ERCs) of NO_x at a ratio of 1.15 to 1.0 pursuant to District Regulation 2-2-302. Pursuant to District Regulation, 2-2-302.2, the applicant has the option to provide POC ERCs to offset the proposed NO_x emission increases at a ratio of 1.15 to 1.0. Currently, the applicant plans to provide 177 tons of NO_x emission reduction credits to offset the proposed NO_x emission increases associated with the PDEF. The applicant is proposing to provide 73.62 tons of NO_x offsets from Banking Certificate #518 which originate from an Owens-Brockway facility located in Oakland. The banking evaluation and review under District application certified that those credits are real, quantifiable, permanent, and enforceable. The balance of the required offsets (103.38 tons/year) were evaluated under District application 18833 (banking Certificate #590) and were generated from the shutdown of a glass melting furnace at an Owens-Brockway facility located in Antioch. The 30-day public review and comment period for those credits ended at 5 p.m. on June 9, 1999. No comments were received. The banking evaluation and review under District application 18833 certified that the credits are real, quantifiable, permanent, and enforceable.

PM_{10} Offsets

With projected PM_{10} emissions of greater than 100 tons per year, the PDEF is considered to be a Major Facility for PM_{10} pursuant to District Regulation 2-2-220.1. Therefore, emission offsets must be provided at a ratio of 1.0 to 1.0 pursuant to District Regulation 2-2-303. Pursuant to District Regulation, 2-2-303.1, the applicant has the option to provide NO_x and/or SO_2 ERCs to offset the proposed PM_{10} emission increases at offset ratios deemed appropriate by the APCO. As stated earlier, the interpollutant offset ratios for SO_2 and NO_x for PM_{10}, are 4.0 to 1.0 and 6.0 to 1.0, respectively. Currently, the applicant plans to provide 98.13 tons of PM_{10} emission reduction credits to offset 98.13 tons of the proposed PM_{10} emission increases resulting from the PDEF. The balance of the PM_{10} emission increases will be offset with SO_2 emission reduction credits at the applicable ratio of 4.0 to 1.0. Therefore, under this scenario, the applicant must provide 103.5 tons of SO_2 emission reduction credits to offset the balance of 25.87 tons of PM_{10} emission increases. 46.3 tons of SO_2 ERCs are from Banking Certificate #518 which were generated by the shutdown of a boiler at an Owens-Brockway facility in Oakland. The balance of the required SO_2 offsets (57.2 tons/year) were evaluated under District application #18833 (Banking Certificate #590) and were generated from the shutdown of a glass melting furnace at an Owens-Brockway facility located in Antioch. The 30-day public review and comment period for those credits ended at 5 p.m. on June 9, 1999. No comments were received. The banking evaluation and review under District application 18833 certified that the credits are real, quantifiable, permanent, and enforceable.

SO_2 Offsets

Pursuant to Regulation 2-2-303, emission reduction credits are not required for the proposed SO_2 emission increases associated with this project since the facility SO_2 emissions will each not exceed 100 tons per year. Regulation 2-2-303 does allow for the voluntary offsetting of SO_2 emission increases of less than 100 tons per year. The Pittsburg District Energy Facility has not volunteered to provide such emission offsets. The required offsets and applicable offset ratios are summarized in Appendix C,
Table C-1.

3. PSD Air Quality Analysis

Pursuant to BAAQMD Regulation 2-2-414.1, the applicant has submitted a modeling analysis that adequately demonstrates the air quality impacts of the PDEF project. The applicant's analysis was based on EPA-approved models and was performed in accordance with District Regulation 2-2-414.

Pursuant to Regulation 2-2-414.2, the District has found that the modeling analysis has demonstrated that the allowable emission increases from the PDEF project, in conjunction with all other applicable emissions, will not cause or contribute to a violation of applicable ambient air quality standards for NO_2, CO, and PM_{10} or an exceedance of any applicable PSD increment.

Pursuant to Regulation 2-2-417, the applicant has submitted an analysis of the impact of the proposed source and source-related growth on visibility, soils, and vegetation.

Please see Appendix E for further detail.

B. Health Risk Assessment

Pursuant to the BAAQMD Risk Management Policy, a health risk screening must be executed to determine the potential impact on public health resulting from the potential emissions of toxic air contaminants (TACs) from the PDEF project. The potential TAC emissions (both carcinogenic and noncarcinogenic) from the PDEF are summarized on page 5, Table 2. In accordance with the requirements of the BAAQMD Risk Management Policy and CAPCOA guidelines, the impact on public health due to the emission of these compounds was assessed utilizing air pollutant dispersion models. The results of the health risk assessment modeling performed by the Pittsburg District Energy Facility are summarized in Table 4.

Table 4
Health Risk Assessment Results

Multi-pathway Carcinogenic Risk (risk in one million)	Noncarcinogenic Chronic Hazard Index	Noncarcinogenic Acute Hazard Index
0.5	0.018	0.042

The health risk assessment performed by the applicant has been reviewed by the District Toxics Evaluation Section and found to comply with current accepted practice as well as BAAQMD policies and procedures. In accordance with the BAAQMD Risk Management Policy, the increased carcinogenic risk attributed to this project is considered to be not significant since it is

less than 1.0 in one million. Furthermore, the acute and chronic hazard indices attributed to this project are considered to be not significant since they are each less than 1.0. Therefore, the PDEF project is deemed to be in compliance with the BAAQMD Risk Management Policy. Please see Appendix D for further detail.

C. Other Applicable District Rules and Regulations

Regulation 1, Section 301: Public Nuisance

None of the project's proposed sources of air contaminants are expected to cause injury, detriment, nuisance, or annoyance to any considerable number of persons or the public with respect to any impacts resulting from the emission of air contaminants regulated by the District. In part, the air quality impact analysis is designed to insure that the proposed facility will comply with this Regulation.

Regulation 2, Rule 1, Sections 301 and 302

Pursuant to Regulation 2-1-301 and 2-1-302, the Pittsburg District Energy Facility has submitted an application to the District to obtain an Authority to Construct and Permit to Operate for the S-1 and S-3 Combustion Turbine Generators, S-2 and S-4 Heat Recovery Steam Generators, and S-5 Auxiliary Boiler.

Because the proposed cooling tower will not be used for the evaporative cooling of process water, it is exempt from District permit requirements (Regulation 2-1-301 and 2-1-302) pursuant to Regulation 2, Rule 1, Section 128.4. Although worst-case emission projections indicate that the cooling towers will emit toxic air contaminants at rates in excess of their risk management screening trigger levels as specified in Table 2-1-316 of Regulation 2, Rule 1, the applicant has demonstrated that the cooling tower emissions have passed a risk screening analysis in accordance with the District Air Toxic Risk Screening Procedure.

Regulation 2, Rule 3: Power Plants

Pursuant to Regulation 2-3-403, this Preliminary Determination of Compliance (DOC) serves as the APCO's preliminary decision as to whether the proposed power plant will meet the requirements of applicable District regulations. The preliminary DOC contains proposed permit conditions to ensure compliance with District regulations. Pursuant to Regulation 2-3-304, the preliminary DOC will be subject to the public notice, public comment, and public inspection requirements contained in Regulation 2-2-406 and 407., On July 15, 1998, the District made a determination pursuant to Regulation 2-2-402 that the Application for Certification contained sufficient information for the District to undertake a Determination of Compliance review.

Regulation 2, Rule 7: Acid Rain

The Pittsburg District Energy Facility will be subject to the requirements of Title IV of the federal Clean Air Act. The requirements of Title IV are outlined in 40 CFR Part 72 and include specifications for the type and operation of continuous emission monitors (CEMs) for pollutants that contribute to the formation of acid rain. District Regulation 2, Rule 7 incorporates by reference the provisions of 40 CFR Part 72.

Regulation 6: Particulate Matter and Visible Emissions

Through the use of dry low-NO_x burner technology and proper combustion practices, the combustion of natural gas at the proposed gas turbines, HRSG duct burners, and auxiliary boiler is not expected to result in visible emissions. Specifically, the facility's combustion sources are expected to comply with Regulation 6, including sections 301 (Ringelmann No. 1 Limitation), 302 (Opacity Limitation) with visible emissions not to exceed 20% opacity, and 310 (Particulate Weight Limitation) with particulate matter emissions of less than 0.15 grains per dry standard cubic foot of exhaust gas volume. As calculated in accordance with Regulation 6-310.3, the grain loading resulting from the simultaneous operation of each power train (CTG and HRSG Duct Burners) is 0.0054 gr/dscf @ 6% O_2. See Appendix A for CTG/HRSG grain loading calculations.

With maximum total dissolved solids content of 970 mg/l and corresponding maximum PM_{10} emission rate of 0.44 lb/hr, the proposed cooling towers are expected to comply with the requirements of Regulation 6.

Particulate matter emissions associated with the construction of the facility are subject to Regulation 6. The California Energy Commission will impose conditions on construction activities that will require the use of water and/or chemical dust suppressants to prevent visible particulate emissions.

Regulation 7: Odorous Substances

Regulation 7-302 prohibits the discharge of odorous substances which remain odorous beyond the facility property line after dilution with four parts odor-free air. Regulation 7-302 limits ammonia emissions to 5000 ppm. Because the ammonia emissions from the SCR system will be limited by permit condition to 10 ppmvd @ 15% O_2, the facility is expected to comply with the requirements of Regulation 7.

Regulation 8: Organic Compounds

This facility is exempt from Regulation 8, Rule 2, “Miscellaneous Operations” per 8-2-110 since natural gas will be fired exclusively at the PDEF.

The use of solvents for cleaning and maintenance at the PDEF is expected to comply with Regulation 8, Rule 4, "General Solvent and Surface Coating Operations" section 302.1 by emitting less than 5 tons per year of volatile organic compounds.

Regulation 9: Inorganic Gaseous Pollutants

Regulation 9, Rule 1; Sulfur Dioxide:

This regulation establishes emission limits for sulfur dioxide from all sources and applies to the combustion sources at this facility. Section 301 (Limitations on Ground Level Concentrations) prohibits emissions which would result in ground level SO_2 concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes, 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours. Section 302 (General Emission Limitation) prohibits SO_2 emissions in excess of 300 ppm (dry). With maximum projected SO_2 emissions of < 1 ppm, the gas turbines and HRSG duct burners are not expected to contribute to noncompliance with ground level SO_2 concentrations and should easily comply with section 302. The auxiliary boiler is expected to comply with these requirements through the exclusive use of natural gas.

Regulation 9, Rule 3, Nitrogen Oxides from Heat Transfer Operations:

The proposed combustion gas turbines (rated at 1929 MM BTU/hr HHV) shall comply with the Regulation 9-3-303 NO_x limit of 125 ppm with nitrogen oxide emissions of 2.5 ppmvd @ 15% O_2. The HRSG duct burners have heat input ratings of less than 250 MM BTU/hr and are therefore not subject to this regulation. The proposed auxiliary boiler will comply with Regulation 9-3-303 with NO_x emissions of 9 ppmvd, @3% O_2.

Regulation 9, Rule 7, Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters:

The proposed HRSGs are exempt from Regulation 9, Rule 7, per section 110.5. The proposed auxiliary boiler (rated at 266 MM BTU per hour) is expected to comply with Regulation 9, Rule 7 section 301.1 with NO_x emissions of 9 ppmv @ 3% O_2 and section 301.2 with expected CO emissions of 50 ppmvd @ 3% O_2 which is much less than the limit of 400 ppmvd @ 3% O_2.

Regulation 9, Rule 9, Nitrogen Oxides from Stationary Gas Turbines:

Because each of the proposed combustion gas turbines will be limited by permit condition to NO_x emissions of 2.5 ppmvd @ 15% O_2, they are expected to comply with the Regulation 9-9-301.3 NO_x limitation of 9 ppmvd @ 15% O_2.

IV Permit Conditions

The following permit conditions will be imposed to ensure that the proposed project complies with all applicable District, State, and Federal Regulations. The conditions limit operational parameters such as fuel use, stack gas emission concentrations, and mass emission rates. Permit conditions will also specify abatement device operation and performance levels. To aid enforcement efforts, conditions specifying emission monitoring, source testing, and record keeping requirements are included.

To provide maximum operational flexibility, no limitations will be imposed on the type, quantity, or duration of gas turbine start-ups or shutdowns. Instead, the facility must comply with daily and annual (consecutive twelve-month) mass emission limits at all times. Compliance with CO and NO_x limitations will be verified by continuous emission monitors (CEMs) that will be in operation during all turbine operating modes, including start-up and shutdown. Compliance with POC, SO_2, and PM_{10} mass emission limits will be verified by annual source testing.

In addition to permit conditions that apply to steady-state operation of each CTG/HRSG power train and the auxiliary boiler, conditions will be imposed that govern equipment operation during the initial commissioning period when the CTG/HRSG power trains will operate without oxidation catalysts and/or SCR systems in place. During this commissioning period, the gas turbines will be tested, control systems will be adjusted, and the HRSGs and auxiliary boiler steam tubes will be cleaned. Permit conditions 1 through 13 apply to this commissioning period.

Pittsburg District Energy Facility
Permit Conditions

Definitions:

Clock Hour:	Any continuous 60-minute period beginning on the hour.
Calendar Day:	Any continuous 24-hour period beginning at 12:00 AM or 0000 hours.
Year:	Any consecutive twelve-month period of time
Heat Input:	All heat inputs refer to the heat input at the higher heating value (HHV) of the fuel, in BTU/scf.
Rolling 3-hour period:	Any three-hour period that begins on the hour and does not include start-up or shutdown periods.
Firing Hours:	Period of time during which fuel is flowing to a unit, measured in fifteen minute increments.
MM BTU:	million british thermal units
Gas Turbine Start-up Mode:	The lesser of the first 120 minutes of continuous fuel flow to the Gas Turbine after fuel flow is initiated or the period of time

	from Gas Turbine fuel flow initiation until the Gas Turbine achieves two consecutive CEM data points in compliance with the emission concentration limits of conditions 21(b) and 21(d).
Gas Turbine Shutdown Mode:	The lesser of the 30 minute period immediately prior to the termination of fuel flow to the Gas Turbine or the period of time from non-compliance with any requirement listed in Conditions 21(a) through 21(f) until termination of fuel flow to the Gas Turbine.
Auxiliary Boiler Start-up:	The lesser of the first 120 minutes of continuous fuel flow to an Auxiliary Boiler after fuel flow is initiated; or the period of time from fuel flow initiation until the Boiler achieves two consecutive CEM data points in compliance with the emission concentration limits of conditions 28(b) and 28(d).
Auxiliary Boiler Shutdown:	The lesser of the 30 minute period immediately prior the termination of fuel flow to the Auxiliary Boiler; or the period of time from non-compliance with any requirement listed in Conditions 28(a) through 28(d) until termination of fuel flow to the auxiliary boiler.
Specified PAHs:	The polycyclic aromatic hydrocarbons listed below shall be considered to Specified PAHs for these permit conditions. Any emission limits for Specified PAHs refer to the sum of the emissions for all six of the following compounds. Benzo[a]anthracene Benzo[b]fluoranthene Benzo[k]fluoranthene Benzo[a]pyrene Dibenzo[a,h]anthracene Indeno[1,2,3-cd]pyrene
Corrected Concentration:	The concentration of any pollutant (generally NO_x, CO, or NH_3) corrected to a standard stack gas oxygen concentration. For emission point P-1 (Gas Turbine S-1 and HRSG S-2) and emission point P-2 (Gas Turbine S-3 and HRSG S-4) the standard stack gas oxygen concentration is 15% O_2 by volume on a dry basis. For emission point P-3 (Auxiliary Boiler S-5), the standard stack gas oxygen concentration is 3% O_2 by volume on a dry basis.
Commissioning Activities:	All testing, adjustment, tuning, and calibration activities recommended by the equipment manufacturers and the PDEF construction contractor to insure safe and reliable steady state operation of the gas turbines, heat recovery steam generators, steam turbine, auxiliary boiler, and associated electrical delivery systems.

Commissioning Period:	The Period shall commence when all mechanical, electrical, and control systems are installed and individual system start-up has been completed, or when a gas turbine is first fired, whichever occurs first. The period shall terminate when the plant has completed performance testing, is available for commercial operation, and has initiated sales to the power exhange.
Precursor Organic Compounds (POCs):	Any compound of carbon, excluding methane, ethane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate
CEC CPM:	California Energy Commission Compliance Program Manager

Conditions for the Commissioning Period

1. The owner/operator of the Pittsburg District Energy Facility (PDEF) shall minimize emissions of carbon monoxide and nitrogen oxides from S-1 & S-3 Gas Turbines, S-2 & S-4 Heat Recovery Steam Generators (HRSG), and S-5 Auxiliary Boiler to the maximum extent possible during the commissioning period. Conditions 1 through 13 shall only apply during the commissioning period as defined above. Unless otherwise indicated, Conditions 14 through 51 shall apply after the commissioning period has ended.

2. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the combustors of S-1 & S-3 Gas Turbines, S-2 & S-4 Heat Recovery Steam Generators, and S-5 Auxiliary Boiler shall be tuned to minimize the emissions of carbon monoxide and nitrogen oxides.

3. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, A-1 & A-3 SCR Systems and A-2 & A-4 Oxidation Catalysts shall be installed, adjusted, and operated to minimize the emissions of carbon monoxide and nitrogen oxides from S-1 & S-3 Gas Turbines and S-2 & S-4 Heat Recovery Steam Generators.

4. Coincident with the steady-state operation of A-1 & A-3 SCR Systems and A-2 & A-4 Oxidation Catalysts pursuant to conditions 3, 8, and 9, the Gas Turbines (S-1 & S-3) and the HRSGs (S-2 & S-4) shall comply with the NO_x and CO emission limitations specified in conditions 21(a) through 21(d).

5. The owner/operator of the PDEF shall submit a plan to the District Permit Services Division and the CEC CPM at least four weeks prior to first firing of S-1 and S-3 Gas Turbines describing the procedures to be followed during the commissioning of the turbines, HRSGs, auxiliary boiler, and steam turbine. The plan shall include a description of each commissioning activity, the anticipated duration of each activity in hours, and the

purpose of the activity. The activities described shall include, but not be limited to, the tuning of the Dry-Low-NO_x combustors, the installation and operation of the SCR systems and oxidation catalysts, the installation, calibration, and testing of the CO and NO_x continuous emission monitors, and any activities requiring the firing of S-1 and S-3 Gas Turbines and S-2 and S-4 HRSGs without abatement by the SCR Systems or oxidation catalysts.

6. During the commissioning period, the owner/operator of the PDEF shall demonstrate compliance with conditions 11 and 12 through the use of properly operated and maintained continuous emission monitors and recorders for the following parameters:

    firing hours
    fuel flow rates
    stack gas nitrogen oxide emission concentrations,
    stack gas carbon monoxide emission concentrations
    stack gas oxygen concentrations.

    The monitored parameters shall be recorded at least once every 15 minutes (excluding normal calibration periods or when the monitored source is not in operation) for S-1 and S-3 Gas Turbines, S-2 and S-4 HRSGs, and S-5 Auxiliary Boiler. The owner/operator shall use District-approved methods to calculate heat input rates, nitrogen oxide mass emission rates, carbon monoxide mass emission rates, and NO_x and CO emission concentrations, summarized for each clock hour and each calendar day. All records shall be retained on site for at least 5 years from the date of entry and made available to District personnel upon request.

7. The District-approved continuous monitors specified in condition 6 shall be installed, calibrated, and operational prior to first firing of S-1 & S-3 Gas Turbines, S-2 & S-4 Heat Recovery Steam Generators, and S-5 Auxiliary Boiler. After first firing of the turbines and auxiliary boiler, the detection range of these continuous emission monitors shall be adjusted as necessary to accurately measure the resulting range of CO and NO_x emission concentrations. The type, specifications, and location of these monitors shall be subject to District review and approval.

8. The total number of firing hours of S-1 Gas Turbine and S-2 Heat Recovery Steam Generator without abatement of nitrogen oxide and carbon monoxide emissions by A-1 SCR System and A-2 Oxidation Catalyst shall not exceed 250 hours during the commissioning period. Such operation of S-1 Gas Turbine and S-2 HRSG without abatement shall be limited to discrete commissioning activities that can only be properly executed without SCR and oxidation catalysts in place. Upon completion of these activities, the owner/operator shall provide written notice to the District Permit Services and Enforcement Divisions and the unused balance of the 250 firing hours without abatement shall expire.

9. The total number of firing hours of S-3 Gas Turbine and S-4 Heat Recovery Steam Generator without abatement of nitrogen oxide and carbon monoxide emissions by A-3 SCR System and A-4 Oxidation Catalyst shall not exceed 250 hours during the commissioning period. Such operation of S-3 Gas Turbine and S-4 HRSG without abatement shall be limited to discrete commissioning activities that can only be properly executed without SCR and oxidation catalysts in place. Upon completion of these activities, the owner/operator shall provide written notice to the District Permit Services and Enforcement Divisions and the unused balance of the 250 firing hours without abatement shall expire.

10. The total mass emissions of nitrogen oxides, carbon monoxide, precursor organic compounds, PM_{10}, and sulfur dioxide that are emitted by S-1, S-2, S-3, S-4, and S-5 during the commissioning period shall accrue towards the consecutive twelve month emission limits specified in condition 33.

11. Combined pollutant emissions from S-1 & S-3 Gas Turbines and S-2 & S-4 Heat Recovery Steam Generators shall not exceed the following limits during the commissioning period. These emission limits shall include emissions resulting from the start-up and shutdown of S-1 & S-3 Gas Turbines.

NO_x (as NO_2)	1,360 pounds per calendar day	616 pounds/hour
CO	6,800 pounds per calendar day	5,053.8 pounds/hour
POC (as CH_4)	720 pounds per calendar day	
PM_{10}	816 pounds per calendar day	
SO_2	268 pounds per calendar day	

12. Pollutant emissions from S-5 Auxiliary Boiler shall not exceed the following limits during the commissioning period. These emission limits shall include emissions that occur during S-5 Auxiliary Boiler start-ups.

NO_x (as NO_2)	69.8 pounds per calendar day	2.91 pounds per hour
CO	233.8 pounds per calendar day	9.74 pounds per hour
POC (as CH_4)	8.64 pounds per calendar day	
PM_{10}	31 pounds per calendar day	
SO_2	3.6 pounds per calendar day	

13. Prior to the end of the Commissioning Period, the Owner/Operator shall conduct a District and CEC approved source test using external continuous emission monitors to determine compliance with condition 23. The source test shall determine NO_x, CO, and POC emissions during start-up and shutdown of the gas turbines. The POC emissions shall be analyzed for methane and ethane to account for the presence of unburned natural gas. The source test shall include a minimum of three start-up and three shutdown

periods. Twenty calendar days before the execution of the source tests, the Owner/Operator shall submit to the District and the CEC CPM a detailed source test plan designed to satisfy the requirements of this condition. The District and the CEC CPM will notify the Owner/Operator of any necessary modifications to the plan within 20 working days of receipt of the plan; otherwise, the plan shall be deemed approved. The Owner/Operator shall incorporate the District and CEC CPM comments into the test plan. The Owner/Operator shall notify the District and the CEC CPM within seven (7) working days prior to the planned source testing date. Source test results shall be submitted to the District and the CEC CPM within 30 days of the source testing date.

Conditions for the Gas Turbines (S-1 & S-3) and the Heat Recovery Steam Generators (HRSGs) (S-2 & S-4).

14. The Gas Turbines (S-1 and S-3) and HRSGs (S-2 and S-4) shall be fired exclusively on natural gas with a maximum sulfur content of 1 grain per 100 standard cubic feet. (BACT for SO_2 and PM_{10})

15. The combined heat input rate to each power train consisting of a Gas Turbine and its associated HRSG (S-1 & S-2 and S-3 & S-4) shall not exceed 2,012 MM BTU per hour, averaged over any rolling 3-hour period. (PSD for NO_x)

16. The combined heat input rate to each power train consisting of a Gas Turbine and its associated HRSG (S-1 & S-2 and S-3 & S-4) shall not exceed 48,288 MM BTU per calendar day. (PSD for PM_{10})

17. The combined cumulative heat input rate for both Gas Turbines (S-1 and S-3) and both HRSGs (S-2 and S-4) shall not exceed 32,500,000 MM BTU per year. (Offsets)

18. The HRSG duct burners shall not be fired unless its associated Gas Turbine is in operation. (BACT for NO_x, CO, POC)

19. The Gas Turbine (S-1) and HRSG (S-2) shall be abated by the properly operated and properly maintained Oxidizing Catalyst (A-1) and Selective Catalytic Reduction System (A-2), in series. (BACT for NO_x and CO)

20. The Gas Turbine (S-3) and HRSG (S-4) shall be abated by the properly operated and properly maintained Oxidizing Catalyst (A-3) and Selective Catalytic Reduction System (A-4), in series. (BACT for NO_x and CO)

21. The owner/operator of the Gas Turbines (S-1 and S-3) and HRSGs (S-2 and S-4) shall meet all of the requirements listed in (a) through (f) below, except during a Gas Turbine Start-up or a Gas Turbine Shutdown. (BACT, PSD, and Toxic Risk Management Policy)

(a) Nitrogen oxide emissions at P-1 (the combined exhaust point for the S-1 Gas Turbine and the S-2 HRSG after control by the A-1 SCR System and A-2 Oxidation Catalyst) shall not exceed 17.5 pounds per hour, calculated as NO_2, nor 0.009 lbs/MM BTU of natural gas fired. Nitrogen oxide emissions at P-2 (the combined exhaust point for the S-3 Gas Turbine and the S-4 HRSG after control by the A-3 SCR System and A-4 Oxidation Catalyst) shall not exceed 17.5 pounds per hour, calculated as NO_2, nor 0.009 lbs/MM BTU of natural gas fired. (PSD for NO_x)

(b) The nitrogen oxide concentration at P-1 and P-2 each shall not exceed 2.5 ppmv, corrected to 15% O_2, on a dry basis, averaged over any 1-hour period. (BACT for NO_x)

(c) Carbon monoxide emissions at P-1 and P-2 each shall not exceed 26.56 pounds per hour, nor 0.0132 lb/MM BTU of natural gas fired. (PSD for CO)

(d) The carbon monoxide concentration at P-1 and P-2 each shall not exceed 6 ppmv, corrected to 15% O_2, on a dry basis, averaged over any rolling 3-hour period. (BACT for CO)

(e) Ammonia (NH_3) emissions at P-1 and P-2 each shall not exceed 10 ppmv, corrected to 15% O_2, on a dry basis, averaged over any rolling 3-hour period. This ammonia emission concentration shall be verified by the continuous records of the ammonia injection rate to A-1 and A-2 SCR Systems. The correlation between the gas turbine and HRSG heat input rates, A-1 and A-2 SCR System ammonia injection rates, and corresponding ammonia emission concentration at emission points P-1 and P-2 shall be determined in accordance with permit condition 38. (TRMP for NH_3)

(f) Precursor organic compound (POC) emissions at P-1 and P-2 each shall not exceed 3.43 pounds per hour, nor 0.0017 lb/MM BTU of natural gas fired. (BACT)

22. The following conditions shall apply to NO_x emissions resulting from or attributable to transient, non-steady state operating conditions. (BACT for NO_x)

(a) CEM NO_x emission concentration data points that result from or are attributable to transient, non-steady state conditions shall not be subject to the emission limitations specified in Condition 21(b). In any event, the nitrogen oxide concentration at P-1 and P-2 each shall not exceed 2.5 ppmv, corrected to 15% O_2, on a dry basis, averaged over any rolling 3-hour period. All CEM NO_x emission concentration data points shall be utilized when determining compliance with this emission concentration limit.

(b) The emission limitation specified in Condition 22(a) shall be valid for a period not to exceed 24 months from the end of the Commissioning period. At such time the emission limitation specified in Condition 21(b) shall apply for all operating conditions except gas turbine start-up and shutdown periods, unless specific transient, non-steady state conditions are identified pursuant to conditions 22(f) and (g).

(c) Definitions

A transient, non-steady state condition shall occur when the following conditions exist:

(1) One or more equipment design features is unable to support rapid changes in operation and respond to and adjust all operating parameters required to maintain the steady-state NOx emission limit specified in condition 21(b). A change in operation shall be limited to one or more of the following: a change in combustion turbine load greater than 6 MW/minute; a change in SCR system space velocity greater than 50 ft/minute; initiation/shutdown of the evaporative cooler; initiation/shutdown of the duct burners; and a change in duct burner firing rate greater than 600,000 BTU/minute. Additional non-steady state conditions may be defined based upon operational experience and mutual written agreement of the owner/operator, the District, ARB, and EPA.

(2) For purposed of this condition, transient, non-steady state conditions shall not include the start-up and shutdown periods that are the subject of condition 23.

(d) The owner/operator shall maintain continuous emission monitor (CEM) data and complete records of plant emission performance under transient, non-steady state conditions. The owner/operator shall record the NO_x emission concentration and document the cause of each transient, non-steady state condition with operational data. A description of the specific parameters that will be monitored to document a transient, non-steady state condition shall be submitted to the District, ARB, and EPA for approval at least 60 days prior to the end of the Commissioning period.

(e) Within 6 months of the end of the Commissioning period, the owner/operator shall compile and submit source test data, using a District-approved test protocol, to assess NO_x emissions under transient, non-steady state conditions. A source test protocol shall be submitted to the District and EPA for approval at least 60 days prior to testing.

(f) Within 15 months of the end of the Commissioning period, the owner/operator shall submit a plan to the District and EPA designed to minimize emissions during transient, non-steady state conditions. The plan shall identify reasonable measures that will be taken to control NO_x emissions. This plan shall be based upon the CEM

and source test data developed in accordance with condition 22(e) and actual operating experience during the preceding months of plant operation. The plan shall be developed in consultation with the manufacturers selected for the gas turbine, HRSG, control systems, and air pollution control units. After the plan has been approved by the District and EPA, the owner/operator shall use the procedures described in the plan to minimize NO_x emissions during transient, non-steady state conditions.

(g) On a semi-annual basis, for the first 24 months after the end of the Commissioning period, the owner/operator shall provide a report to the District with continuous emission monitoring and source test data developed in accordance with this condition. The District will use the data and related operating experience to establish maximum NO_x emission limits for transient, non-steady state conditions for the following 6 month period. The District will consider operations at similar (e.g., electrical generation and fuel-type) facilities in determining the revised emission limits. In no event shall the NO_x emission limits established pursuant to section (g) be less than the NO_x emission limits specified in Condition 21(b). In addition, if appropriate, on a semi-annual basis the district will use all data and related operating experience to establish (i) a revised definition of transient, non-steady state conditions to which the NO_x emission limitations established pursuant to this section (g) shall apply, and (ii) the data collection and recordkeeping requirements that the owner/operator shall use to document the occurrence of transient non-steady state conditions.

23. The pollutant emission rates from each of the Gas Turbines (S-1 and S-3) during a start-up or shutdown shall not exceed the limits established below. These limits apply to any 60-minute period, not a three-hour average. (PSD)

	Start-Up (lbs/hr)	Shutdown (lbs/hr)
Oxides of Nitrogen (as NO_2)	223	58
Carbon Monoxide (CO)	1821	238
Precursor Organic Compounds (as CH_4)	239	253

Within three months of the end of the Commissioning period, the owner/operator shall submit a plan designed to minimize emissions during the transient conditions encountered during gas turbine start-ups and shutdowns. This plan shall indicate what steps will be taken to start controlling NO_x emissions as soon as feasible, including when ammonia can be fed to the SCR system without producing ammonia slip in excess of 10 ppmvd @ 15% O_2. This plan shall be based upon the experience gathered from the source tests performed per condition #13 and actual operating experience gained during the first six-months of operation. This plan shall also be developed in consultation with the manufacturers of the gas turbines, HRSGs, control systems, and air pollution control units. This plan shall be submitted to the CEC CPM for approval. After the plan has been

approved, the owner/operator shall use the procedures included in the plan to minimize NO_x emissions during gas turbine start-ups and shutdowns.

Within 24 months of the end of the Commissioning period, the owner/operator shall submit a report to the District and the CEC CPM that establishes reasonable maximum hourly mass emission rates for start-up and shutdown conditions. The revised mass emission rates shall be based upon source test and continuous emission monitoring data. Pending approval of the District and the CEC CPM, these revised mass emission rates shall be established as new emission limitations that will supersede the limits included in this condition.

24. The Gas Turbines (S-1 and S-3) shall not be in start-up mode simultaneously. (PSD)

Conditions for the Auxiliary Boiler (S-5)

25. The Auxiliary Boiler (S-5) shall be fired exclusively on natural gas with a maximum sulfur content of 1 grain per 100 standard cubic feet. (BACT for SO_2 and PM_{10})

26. The heat input rate to the Auxiliary Boiler (S-5) shall not exceed 266 million BTU per hour, averaged over any rolling 3-hour period. (Cumulative Increase)

27. The cumulative heat input rate to the Auxiliary Boiler (S-5) shall not exceed 399,000 million BTU per year. (Cumulative Increase)

28. The owner/operator of the Auxiliary Boiler (S-5) shall meet all of the requirements listed in (a) through (d) below, except during an Auxiliary Boiler Start-up or an Auxiliary Boiler Shutdown. (BACT, PSD)

    (a) Nitrogen oxide emissions at P-3 (the exhaust point for the Auxiliary Boiler) shall not exceed 2.9 pounds per hour, calculated as NO_2. (PSD for NO_x)

    (b) The nitrogen oxide concentration at P-3 shall not exceed 9.0 ppmv, measured as NO_x, corrected to 3% O_2, on a dry basis, averaged over any rolling 3-hour period. (BACT for NO_x)

    (c) Carbon monoxide emissions at P-3 shall not exceed 9.8 pounds per hour. (PSD for CO)

    (d) The carbon monoxide concentration at P-3 shall not exceed 50 ppmv, corrected to 3% O_2, on a dry basis, averaged over any rolling 3-hour period. (BACT for CO)

(e) Precursor organic compound (POC) emissions at P-3 shall not exceed 0.36 pounds per hour.

29. The Auxiliary Boiler (S-5), its burners, combustion chamber, and exhaust system shall be designed and constructed so that the boiler can be retrofitted with an SCR system and/or an oxidizing catalyst in the event the Auxiliary Boiler cannot consistently comply with the emission limitations specified in condition 28. (BACT for NO_x and CO)

Conditions for All Sources
(S-1, S-2, S-3, S-4, and S-5)

30. The combined heat input rate to the Gas Turbines (S-1 and S-3), HRSGs (S-2 and S-4), and Auxiliary Boiler (S-5) shall not exceed 102,960 million BTU per calendar day. (PSD, CEC Offsets)

31. The cumulative heat input rate to the Gas Turbines (S-1 and S-3), HRSGs (S-2 and S-4), and Auxiliary Boiler (S-5) combined shall not exceed 32,900,000 million BTU per year. (Offsets)

32. Total combined emissions from the Gas Turbines, HRSGs, and Auxiliary Boiler (S-1, S-2, S-3, S-4, and S-5), including emissions generated during Gas Turbine Start-ups, Gas Turbine Shutdowns, Auxiliary Boiler Start-ups, and Auxiliary Boiler Shutdowns, shall not exceed the following limits during any calendar day:

(a)	1190 pounds of NO_x (as NO_2) per day	(CEQA)
(b)	5224 pounds of CO per day	(PSD)
(c)	892 pounds of POC (as CH_4) per day	(CEQA)
(d)	842 pounds of PM_{10} per day	(PSD)
(e)	272.4 pounds of SO_2 per day	(BACT)

During days with two cold start-ups (the Gas Turbines have been out of service for more than 72 hours) daily combined NO_x emissions (as NO_2) from the Gas Turbines, HRSGs, and Auxiliary Boiler (S-1, S-2, S-3, S-4, and S-5) shall not exceed 1330 pounds per day. The number of days where the combined NO_x emissions are greater 1190 lb/day and less than 1330 lb/day shall be limited to 10 per consecutive twelve month period.

33. Cumulative emissions from the Gas Turbines, HRSGs, and the Auxiliary Boiler combined (S-1, S-2, S-3, S-4, and S-5), including emissions generated during Gas Turbine Start-ups, Gas Turbine Shutdowns, Auxiliary Boiler Start-ups, and Auxiliary Boiler Shutdowns, shall not exceed the following limits during any consecutive twelve-month period:

(a)	153.2 tons of NO_x (as NO_2) per year	(Offsets, PSD)
(b)	487.5 tons of CO per year	(Cumulative Increase)

(c) 97.61 tons of POC (as CH_4) per year (Offsets)
(d) 123.55 tons of PM_{10} per year (Offsets, PSD)
(e) 39.86 tons of SO_2 per year (Cumulative Increase)

34. The maximum projected annual toxic air contaminant emissions from the Gas Turbines, HRSGs, and the Auxiliary Boiler combined (S-1, S-2, S-3, S-4, and S-5) shall not exceed the following limits:

(a) 3,668 pounds of formaldehyde per year
(b) 441.7 pounds of benzene per year
(c) 76.2 pounds of Specified polycyclic aromatic hydrocarbons (PAHs) per year

unless the owner/operator meets the requirements of (d), (e), and (f) below:

(d) The owner/operator shall perform a health risk assessment using the emission rates determined by source test and the most current Bay Area Air Quality Management District (District) approved procedures and unit risk factors in effect at the time of the analysis. The calculated excess cancer risk shall not exceed 1.0 in one million.

(e) The owner/operator shall perform a second risk analysis using the emission rates determined by source test and the procedures and unit risk factors in effect when the Determination of Compliance was issued. The calculated excess cancer risk shall not exceed 1.0 in one million.

(f) Both of these risk analyses shall be submitted to the District and the CEC CPM within 60 days of the source test date. The owner/operator may request that the District and the CEC CPM revise the carcinogenic compound emission limits specified above. If the owner/operator demonstrates to the satisfaction of the APCO that these revised emission limits will satisfy the conditions stated in parts (d) and (e) above, the District and the CEC CPM may, at their discretion, adjust the carcinogenic compound emission limits listed above. (TRMP)

35. The owner/operator shall demonstrate compliance with conditions 15 through 18, 21(a) through 21(d), 23, 24, 26, 28(a) through 28(d), 32(a), 32(b), 33(a), and 33(b) by using properly operated and maintained continuous monitors (during all hours of operation including equipment Start-up and Shutdown periods) for all of the following parameters:

(a) Firing Hours and Fuel Flow Rates for each of the following sources: S-1 and S-2 combined, S-3 and S-4 combined, and S-5.
(b) Oxygen (O_2) Concentrations, Nitrogen Oxides (NO_x) Concentrations, and Carbon Monoxide (CO) Concentrations at each of the following exhaust points: P-1, P-2 and P-3.
(c) Ammonia injection rate at A-1 and A-2 SCR Systems

The owner/operator shall record all of the above parameters every 15 minutes (excluding normal calibration periods) and shall summarize all of the above parameters for each clock hour. For each calendar day, the owner/operator shall calculate and record the total Firing Hours, the average hourly Fuel Flow Rates, and pollutant emission concentrations.

The owner/operator shall use the parameters measured above and District-approved calculation methods to calculate the following parameters:

(c) Heat Input Rate for each of the following sources: S-1 and S-2 combined, S-3 and S-4 combined, and S-5.
(d) Corrected NO_x concentrations, NO_x mass emissions (as NO_2), corrected CO concentrations, and CO mass emissions at each of the following exhaust points: P-1, P-2, and P-3.

For each source, source grouping, or exhaust point, the owner/operator shall record the parameters specified in conditions 35(c) and 35(d) at least once every 15 minutes (excluding normal calibration periods). As specified below, the owner/operator shall calculate and record the following data:

(e) total Heat Input Rate for every clock hour and the average hourly Heat Input Rate for every rolling 3-hour period.
(f) on an hourly basis, the cumulative total Heat Input Rate for each calendar day for the following: each Gas Turbine and associated HRSG combined, the Auxiliary Boiler, and all five sources (S-1, S-2, S-3, S-4, and S-5) combined.
(g) the average NO_x mass emissions (as NO_2), CO mass emissions, and corrected NO_x and CO emission concentrations for every clock hour and for every rolling 3-hour period.
(h) on an hourly basis, the cumulative total NO_x mass emissions (as NO_2) and the cumulative total CO mass emissions, for each calendar day for the following: each Gas Turbine and associated HRSG combined, the Auxiliary Boiler, and all five sources (S-1, S-2, S-3, S-4, and S-5) combined.
(i) For each calendar day, the average hourly Heat Input Rates, Corrected NO_x emission concentrations, NO_x mass emissions (as NO_2), corrected CO emission concentrations, and CO mass emissions for each Gas Turbine and associated HRSG combined and the Auxiliary Boiler.
(j) on a daily basis, the cumulative total NO_x mass emissions (as NO_2) and cumulative total CO mass emissions, for each calendar year for all five sources (S-1, S-2, S-3, S-4, and S-5) combined.

(1-520.1, 9-9-501, BACT, Offsets, NSPS, PSD, Cumulative Increase)

36. To demonstrate compliance with conditions 23, 32(c) through 32(e), and 33(c) through 33(e), the owner/operator shall calculate and record on a daily basis, the Precursor Organic Compound (POC) mass emissions, Fine Particulate Matter (PM_{10}) mass emissions (including condensable particulate matter), and Sulfur Dioxide (SO_2) mass emissions from each power train and the auxiliary boiler. The owner/operator shall use the actual Heat Input Rates calculated pursuant to condition 35, actual Gas Turbine Start-up Times, actual Gas Turbine Shutdown Times, and CEC and District-approved emission factors to calculate these emissions. The calculated emissions shall be presented as follows:

    (a) For each calendar day, POC, PM_{10}, and SO_2 Emissions shall be summarized for: each power train (Gas Turbine and its respective HRSG combined); the Auxiliary Boiler; and the five sources (S-1, S-2, S-3, S-4, and S-5) combined.
    (b) on a daily basis, the cumulative total POC, PM_{10}, and SO_2 mass emissions, for each year for all five sources (S-1, S-2, S-3, S-4, and S-5) combined.

    (Offsets, PSD, Cumulative Increase)

37. To demonstrate compliance with Condition 34, the owner/operator shall calculate and record on an annual basis the maximum projected annual emissions of: Formaldehyde, Benzene, and Specified PAH's. Maximum projected annual emissions shall be calculated using the maximum Heat Input Rate of 32,912,920 MM BTU/year and the highest emission factor (pounds of pollutant per MM BTU of Heat Input) determined by any source test at the Gas Turbine, HRSG, or Auxiliary Boiler. (TRMP)

38. Within 60 days of start-up of the PDEF, the owner/operator shall conduct a District-approved source test on exhaust point P-1 or P-2 to determine the corrected ammonia (NH_3) emission concentration to determine compliance with condition 21(e). The source test shall determine the correlation between the heat input rates of the gas turbine and associated HRSG, A-1 or A-2 SCR System ammonia injection rate, and the corresponding NH_3 emission concentration at emission point P-1 or P-2. The source test shall be conducted over the expected operating range of the turbine (at a minimum, 60%, 80%, and 100% load) to establish the range of ammonia injection rates necessary to achieve NO_x emission reductions while maintaining ammonia slip levels. Continuing compliance with condition 21(e) shall be demonstrated through calculations of corrected ammonia concentrations based upon the source test correlation and continuous records of ammonia injection rate. (TRMP)

39. Within 60 days of start-up of the PDEF and on an annual basis thereafter, the owner/operator shall conduct a District-approved source test on exhaust points P-1 and P-2 while each Gas Turbine and associated Heat Recovery Steam Generator are operating at maximum load to determine compliance with Conditions 21(a), (b), (c), (d), & (f) and while each Gas Turbine and associated Heat Recovery Steam Generator are

operating at minimum load to determine compliance with Conditions 21(c), (d), & (f) and to verify the accuracy of the continuous emission monitors required in condition 35. The owner/operator shall test for (as a minimum): water content, stack gas flow rate, oxygen concentration, precursor organic compound concentration and emissions, methane, ethane, and particulate matter (PM_{10}) emissions including condensable particulate matter. (BACT, offsets)

40. Within 60 days of start-up of the PDEF and on an annual basis thereafter, the owner/operator shall conduct a District approved source test on exhaust point P-3 while the Auxiliary Boiler (S-5) is operating at maximum allowable operating rates to determine compliance with the emission limitations of Condition 28(a) through 28(d) and to verify the accuracy of the continuous emission monitors required in condition 35. The owner/operator shall test for (as a minimum): water content, stack gas flow rate, oxygen concentration, precursor organic compound concentration and emissions, and particulate matter (PM_{10}) emissions including condensable particulate matter. (BACT, offsets)

41. The owner/operator shall obtain approval for all source test procedures from the District's Source Test Section and the CEC CPM prior to conducting any tests. The owner/operator shall comply with all applicable testing requirements for continuous emission monitors as specified in Volume V of the District's Manual of Procedures. The owner/operator shall notify the District's Source Test Section and the CEC CPM in writing of the source test protocols and projected test dates at least 7 days prior to the testing date(s). As indicated above, the Owner/Operator shall measure the contribution of condensable PM (back half) to the total PM_{10} emissions. However, the Owner/Operator may propose alternative measuring techniques to measure condensable PM such as the use of a dilution tunnel or other appropriate method used to capture semi-volatile organic compounds. Source test results shall be submitted to the District and the CEC CPM within 30 days of conducting the tests. (BACT)

42. Within 60 days of start-up of the PDEF and on an biennial basis (once every two years) thereafter, the owner/operator shall conduct a District-approved source test on exhaust point P-1 or P-2 while the Gas Turbine and associated Heat Recovery Steam Generator are operating at maximum allowable operating rates to demonstrate compliance with Condition 34. Unless the requirements of condition 42(b) have been met, the owner/operator shall determine the formaldehyde, benzene, and Specified PAH emission rates (in pounds/MM BTU). If any of the above pollutants are not detected (below the analytical detection limit), the emission concentration for that pollutant shall be deemed to be one half (50%) of the detection limit concentration. (TRMP)

    (a) The owner/operator shall calculate the maximum projected annual emission rate for each pollutant by multiplying the pollutant emission rate (in pounds/MM BTU; determined by source testing) by 32,912,920 MM BTU/year.

(b) If three consecutive biennial source tests demonstrate that the emission rates calculated pursuant to part (a) for any of the compounds listed below are less than the annual emission rates shown, then the owner/operator may discontinue future testing for that pollutant:

Benzene	≤	221 pounds/year
Formaldehyde	≤	1,834 pounds/year
Specified PAH's	≤	38 pounds/year

(TRMP)

43. The owner/operator shall submit all reports (including, but not limited to monthly CEM reports, monitor breakdown reports, emission excess reports, equipment breakdown reports, etc.) as required by District Rules or Regulations and in accordance with all procedures and time limits specified in the Rule, Regulation, Manual of Procedures, or Enforcement Division Policies & Procedures Manual. (Regulation 2-6-502)

44. The owner/operator shall maintain all records and reports on site for a minimum of 5 years. These records shall include but are not limited to: continuous monitoring records (firing hours, fuel flows, emissions, monitor excesses, breakdowns, etc.), source test and analytical records, emission calculation records, records of plant upsets and related incidents. The owner/operator shall make all records and reports available to District and the CEC CPM staff upon request. (Regulation 2-6-501)

45. The owner/operator shall notify the District and the CEC CPM of any violations of these permit conditions. Notification shall be submitted in a timely manner, in accordance with all applicable District Rules, Regulations, and the Manual of Procedures. Not withstanding the notification and reporting requirements given in any District Rule, Regulation, or the Manual of Procedures, the owner/operator shall submit written notification (facsimile is acceptable) to the Enforcement Division within 96 hours of the violation of any permit condition. (Regulation 2-1-403)

46. The stack heights of the emission points P-1 and P-2 shall be at least 150 feet above mean sea level (approximately 138.8 feet above grade level at the stack base). The stack height of the emission point P-3 shall be at least 100.6 feet above mean sea level (approximately 88.6 feet above grade level at the stack base). (PSD, TRMP)

47. The Owner/Operator of PDEF shall provide adequate stack sampling ports and platforms to enable the performance of source testing. The location and configuration of the stack sampling ports shall be subject to BAAQMD review and approval.
(Regulation 1-501)

48. Within 180 days of the issuance of the Authority to Construct, the Owner/Operator shall contact the BAAQMD Technical Services Division regarding requirements for the continuous monitors, sampling ports, platforms, and source tests required by Conditions 38, 39, 40, and 42. All source testing and monitoring shall be conducted in accordance with the BAAQMD Manual of Procedures. (Regulation 1-501)

49. Prior to the issuance of the BAAQMD Authority to Construct for the Pittsburg District Energy Facility, the Owner/Operator shall demonstrate that valid emission reduction credits in the amount of 176.18 tons/year of Nitrogen Oxides, 112.25 tons/year of Precursor Organic Compounds, and 123.55 tons/year of PM_{10} or equivalent as defined by District Regulations 2-2-302.1, 2-2-302.2, and 2-2-303.1 are under their control through option to purchase contracts or equivalent binding legal documents. (Offsets)

50. Prior to the start of construction of the Pittsburg District Energy Facility, the Owner/Operator shall provide emission reduction credits in the amount of 176.18 tons/year of Nitrogen Oxides, 112.25 tons/year of Precursor Organic Compounds, and 123.55 tons/year of PM_{10} or equivalent as defined by District Regulations 2-2-302.1, 2-2-302.2, and 2-2-303.1. (Offsets)

51. Pursuant to BAAQMD Regulation 2, Rule 6, section 404.1, the owner/operator of PDEF shall submit an application to the District for a Federal (Title V) Operating Permit within 12 months of the date of issuance of the BAAQMD Permit to Operate for the PDEF. (Regulation 2-6-404.1)

V Recommendation

The APCO has concluded that the proposed Pittsburg District Energy Facility power plant, which is composed of the sources listed below, meets the requirements of all applicable District regulations. These sources will be subject to the permit conditions and BACT and offset requirements discussed previously.

S-1 Combustion Gas Turbine #1, General Electric Frame 7FA Model PG 7241 or equivalent; 1,929 MM BTU per hour, equipped with dry low-NO_x Combustors, abated by A-1 Selective Catalytic Reduction System and A-2 Oxidation Catalyst

S-2 Heat Recovery Steam Generator #1, equipped with dry low-NO_x Duct Burners, 83 MM BTU per hour, abated by A-1 Selective Catalytic Reduction System and A-2 Oxidation Catalyst.

S-3 Combustion Gas Turbine #2, General Electric Frame 7FA Model PG 7241 or equivalent; 1,929 MM BTU per hour, equipped with dry low-NO_x Combustors, abated by A-3 Selective Catalytic Reduction System and A-4 Oxidation Catalyst

S-4 Heat Recovery Steam Generator #2, equipped with dry low-NO_x Duct Burners, 83 MM BTU per hour, abated by A-3 Selective Catalytic Reduction System and A-4 Oxidation Catalyst.

S-5 Auxiliary Steam Boiler, 266 MM BTU per hour, equipped with low-NO_x burners

Pursuant to District Regulation 2-3-404, this document shall be subject to the public notice, public comment, and public inspection requirements of Regulation 2-2-406 and 2-2-407.

Appendix A

Emission Factor Derivations

The following physical constants and standard conditions were utilized to derive the criteria-pollutant emission factors used to calculate criteria pollutant and toxic air contaminant emissions.

standard temperature[a]: 70°F
standard pressure[a]: 14.7 psia
molar volume: 385.3 dscf/lbmol
ambient oxygen concentration: 20.95%
dry flue gas factor[b]: 8600 dscf/MM BTU
natural gas higher heating value: 1030 BTU/dscf

[a]BAAQMD standard conditions per Regulation 1, Section 228.

[b]based upon the assumption of complete stoichiometric combustion of natural gas. In effect, all excess air present before combustion is assumed to be emitted in the exhaust gas stream. Based upon typical composition of natural gas.

Table A-1 summarizes the criteria pollutant and toxic air contaminant emission factors that were used to calculate mass emissions for each source. All units are pounds per million BTU of natural gas fired based upon the high heating value (HHV). All applicable abatement efficiency factors are included.

Table A-1
Controlled Regulated Air Pollutant Emission Factors
(lb/MM BTU)

Pollutant	Source			
	CTG	HRSG	CTG & HRSG Combined	Auxiliary Boiler
Nitrogen Oxides (as NO_2)	0.009[a]	0.009[a]	0.009[a]	0.0107
Carbon Monoxide	0.0132[b]	0.0132[b]	0.0132[b]	0.0365
Precursor Organic Compounds	0.00136	0.01	0.0017	0.00137
Particulate Matter (PM_{10})	0.00845	0.00845	0.00845	0.005
Sulfur Dioxide	0.00277	0.00277	0.00277	0.00277

[a]based upon the permit condition emission limit of 2.5 ppmvd NO_x @ 15% O_2 that reflects the use of dry low-NO_x combustors at the CTG, low-NO_x burners at the HRSG, and abatement by the proposed A-1 and A-3 Selective Catalytic Reduction Systems with Ammonia Injection

[b]based upon the permit condition emission limit of 6 ppmvd CO @ 15% O_2

REGULATED AIR POLLUTANTS

NITROGEN OXIDE EMISSION FACTORS

Combustion Turbine Generator and Heat Recovery Steam Generator Combined

The combined NO_x emissions from the CTG and HRSG will be limited to 2.5 ppmv, dry @ 15% O_2. This emission limit will also apply when the HRSG duct burners are in operation. This concentration is converted to a mass emission factor as follows:

(2.5 ppmvd)(20.95 - 0)/(20.95 - 15) = 8.8 ppmv NO_x, dry @ 0% O_2

$(8.8/10^6)$(1 lbmol/385.3 dscf)(46.01 lb NO_2/lbmol)(8600 dscf/MM BTU)

= **0.009 lb NO_2/MM BTU**

Auxiliary Boiler

The auxiliary boiler NO_x emissions will be limited to the BACT level of 9 ppmv, dry @ 3% O_2. This concentration is converted to a mass emission factor as follows:

(9 ppmvd)(20.95 - 0)/(20.95 - 3) = 10.5 ppmv, dry @ 0% O_2

$[(10.5/10^6)$/385.3 dscf/lbmol](46.01 lb NO_2/lbmol)(8600 dscf/MM BTU)

= **0.0108 lb NO_2/MM BTU**

CARBON MONOXIDE EMISSION FACTORS

Combustion Turbine Generator and Heat Recovery Steam Generator Combined

The combined CO emissions from the CTG and HRSG duct burner will be conditioned to a maximum controlled CO emission limit of 6 ppmv, dry @ 15% O_2. The emission factor corresponding to this emission concentration is calculated as follows:

(6 ppmv)(20.95 - 0)/(20.95 - 15) = 21.13 ppmv, dry @ 0% O_2

$(21.13/10^6)$(lbmol/385.3 dscf)(28 lb CO/lbmol)(8600 dscf/MM BTU)

= **0.0132 lb CO/MM BTU**

The corresponding CO emission rate in lb/hr based upon the maximum combined firing rate of the CTG and HRSG is calculated as follows:

(0.0132 lb/MM BTU)(2,012 MM BTU/hr) = 26.56 lb CO/hr

Auxiliary Boiler

Pursuant to current BACT Guidelines and vendor guarantees, the auxiliary boiler will achieve a CO emission concentration of 50 ppmv, dry @ 3% O_2. The emission factor corresponding to this emission concentration is calculated as follows:

(50 ppmv)(20.95 - 0)/(20.95 - 3) = 58.35 ppmv, dry @ 0% O_2

$(58.35/10^6)$(lbmol/385.3 dscf)(28 lb CO/lbmol)(8600 dscf/MM BTU)

= **0.0365 lb CO/MM BTU**

PRECURSOR ORGANIC COMPOUND (POC) EMISSION FACTORS

Combustion Turbine Generator

The turbine vendor, G.E. has guaranteed a POC (non-methane/ethane hydrocarbon) emission concentration of 1.40 ppmw @ 15% O_2. Engelhard, the oxidation catalyst vendor, has guaranteed a POC conversion efficiency of 30% by weight. Based upon a turbine exhaust gas moisture content of 9% by volume, the POC emission factor is calculated as follows:

(1.4 ppmvw)/(1 – 0.09) = 1.54 ppmvd @ 15 % O_2

(1.54 ppmvd)(20.95)/(20.95 – 0.15) = 5.42 ppmvd @ 0% O_2

$(5.42/10^6)$(lb-mol/385.3 dscf)(16 lb/lb-mol)(8600 dscf/MM BTU) = 0.00194 lb/MM BTU

Applying the oxidation catalyst conversion efficiency yields:

(0.00194 lb/MM BTU)(1 – 0.30) = 0.00136 lb/MM BTU

Converting to a mass emission rate:

POC = (0.00136 lb/MM BTU)(1929 MM BTU/hr) = 2.62 lb/hr

Heat Recovery Steam Generator

The duct burner vendor has guaranteed a POC emission factor of 0.014 lb/MM BTU. Given the duct burner heat input rate of 83 MM BTU/hr, and the oxidation catalyst POC conversion efficiency of 30% (wt), this converts to a mass emisson rate of:

POC = (0.014 lb/MM BTU)(83 MM BTU/hr)(1 - 0.30) = 0.81 lb/hr

Combustion Turbine Generator and Heat Recovery Steam Generator Combined

The combined POC mass emission rate is calculated as follows:

2.62 lb/hr + 0.81 lb/hr = 3.43 lb/hr

This converts to an emission factor of:

(3.43 lb/hr)/2012 MM BTU/hr) = 0.0017 lb/MM BTU

Auxiliary Boiler

Per AP-42, Section 1.4, Table 1.4-3, the applicable POC emission factor for the auxiliary boiler is 1.7 lb POC/10^6 ft^3. 17% (wt) of the POC is considered to be methane.

The **POC emission factor** is therefore:

(1.7 lb POC/10^6 ft^3)(1 ft^3/1030 BTU)(1 - 0.17) = **0.00137 lb POC/MM BTU**

PARTICULATE MATTER (PM_{10}) EMISSION FACTORS

Combustion Turbine Generator and HRSG Combined

To maximize flexibility, the applicant has opted to use the ABB vendor guarantee for PM_{10} of 17 lb/hr at the maximum combined firing rate of 2,012 MM BTU/hr. In light of the small heat input rate of the HRSG duct burners (83 MM BTU/hr) relative to the gas turbine heat input rate, it is assumed that the 17 lb/hr PM_{10} emission rate also applies to simultaneous firing of the CTG and HRSG duct burners. The corresponding PM_{10} emission factor is therefore:

(17 lb PM_{10}/hr)/(2,012 MM BTU/hr) = **0.00845 lb PM_{10}/MM BTU**

It is assumed that this PM_{10} emission factor includes secondary PM_{10} formation of ammonium bisulfate.

The following stack data will be used to calculate the grain loading for simultaneous CTG and HRSG operation at standard conditions to determine compliance with BAAQMD Regulation 6-310.3.

PM_{10} mass emission rate:	17 lb/hr
typical flow rate:	980,661 acfm
water content:	9% by volume
observed temperature:	203°F
standard temperature:	70°F
oxygen content (wet basis):	12% O_2 by volume
oxygen content (dry basis):	13.2% O_2 by volume

Correcting the flow rate to standard conditions yields:

(980,661 acfm)(70 + 460/203 + 460)(1 - 0.09) = 713,383 dscfm

Converting to grains/dscf:

(17 lb PM_{10}/hr)(1 hr/60 min)(7000 gr/lb)/(713,383 dscfm) = 0.0028 gr/dscf

Converting to 6% O_2 basis:

(0.0028 gr/dscf)[(20.95 - 6)/(20.95 – 13.2)] = 0.0054 gr/dscf @ 6% O_2

Auxiliary Boiler

Per AP-42, Section 1.4, Table 1.4-2, the applicable PM_{10} emission factor for the auxiliary boiler is 5 lb $PM_{10}/10^6$ ft^3.

The **PM_{10} emission factor** is therefore:

(5 lb $PM_{10}/10^6$ ft^3)(1 ft^3/1,030 BTU) = **0.005 lb PM_{10}/MM BTU**

SULFUR DIOXIDE EMISSION FACTORS

Combustion Turbine Generator & Heat Recovery Steam Generator

The SO_2 emission factor is based upon a maximum natural gas sulfur content of 1 gr/100 scf and a higher heating value of 1030 BTU/ft^3 as specified by PG&E. It applies to the firing of the CTG alone, the HRSG alone, and the CTG and HRSG simultaneously.

The sulfur emission factor is calculated as follows:

(1 gr S/100 scf)(1 scf/1,030 BTU)(2 gr SO_2/1 gr S)(1 lb/7000 gr)(10^6 BTU/MM BTU)

= **0.00277 lb SO_2/MM BTU**

This is converted to an emission concentration as follows:

(0.00277 lb SO_2/MM BTU)(385.3 dscf/lbmol)(10^6)(lbmol/64.06 lb SO_2)(MM BTU/8600 dscf)

= 1.94 ppmvd SO_2 @ 0% O_2

which is equivalent to:

(1.94 ppmvd)(20.95 - 15)/20.95 = 0.55 ppmv SO_2, dry @ 15% O_2

Auxiliary Boiler

As in the case of the CTG and HRSG, the maximum sulfur content of natural gas will be limited to 1 gr/100 scf. The **SO_2 emission factor** for the auxiliary boiler is therefore also **0.0027 lb SO_2/MM BTU**.

Toxic Air Contaminants

The following toxic air contaminant emission factors were used to calculate worst-case emissions rates used for air pollutant dispersion models that estimate the resulting increased health risk to the maximally exposed population. To ensure that the risk is properly assessed, the emission factors are conservative and may overestimate actual emissions.

Table A-2 TAC Emission Factors[a] for CTGs

Contaminant	Emission Factor (lb/MM scf)
Acetaldehyde[c]	6.86E-02
Acrolein	2.37E-02
Ammonia[b]	12.2
Benzene[c]	1.36E-02
1,3-Butadiene[c]	1.27E-04
Ethylbenzene	1.79E-02
Formaldehyde[c]	1.10E-01
Hexane	2.59E-01
Napthalene	1.66E-03
PAHs[c]	2.32E-03
Propylene	7.70E-01
Propylene Oxide[c]	4.78E-02
Toluene	7.10E-02
Xylene	2.61E-02

[a]the highest of either Ventura County APCD or CATEF emission factors for gas turbines

[b]based upon maximum allowable ammonia slip of 10 ppmv, dry @ 15% O_2

[c]carcinogenic compound

Table A-3 TAC Emission Factors[a] for Auxiliary Boiler

Contaminant	Emission Factor (lb/MM scf)
Acetaldehyde[b]	0.0089
Acrolein	0.0008
Benzene[b]	0.00431
Ethylbenzene	0.002
Formaldehyde[b]	0.221
Hexane	0.0013
Napthalene	0.0003
PAHs[b]	0.0004
Propylene	0.1553
Toluene	0.0078
Xylene	0.0058

[a]the highest of either Ventura County APCD or CATEF emission factors for industrial boilers

[b]carcinogenic compound

Table A-4 TAC Emission Factors[a] for Cooling Towers

Contaminant	Emission Factor (lb/hr)
Aluminum	4.5E-05
Arsenic[b]	1.8E-06
Silver	2.3E-06
Barium	5.4E-06
Beryllium[b]	4.5E-06
Cadmium[b]	4.5E-06
Chloride	0.1027
Hexavalent chromium[b]	2.3E-06
Copper	3.2E-06
Fluoride	3.2E-04
Lead[b]	9.9E-06
Magnesium	1.2E-02
Manganese	6.1E-05
Mercury	9.1E-08
Selenium[b]	3.2E-06
Silica[b]	1.2E-05
Sodium hydroxide	3.2E-06
Sulfate	8.8E-02

Zinc	5.6E-06

[a]based upon 24 hr/day, 365 day/yr operation of cooling towers at maximum flow rate

[b]carcinogenic compound

AMMONIA EMISSION FACTOR

Combustion Turbine Generator & Heat Recovery Steam Generator

Each CTG/HRSG power train will exhaust through a common stack and be subject to a maximum ammonia exhaust concentration limit of 10 ppmvd @ 15% O_2.

NH_3 emission concentration limit:	10 ppmvd @ 15% O_2
normal wet gas flow rate:	980,661 acfm
maximum wet gas flow rate:	1,026,503 acfm
moisture content:	8% - 9% by vol. (CTG alone)
	17% - 19% by vol. (with HRSG duct burner firing)
observed temperature:	203°F
standard temperature:	70°F
oxygen content (wet basis):	11% - 12% O_2 by volume

The exhaust gas oxygen content on a dry basis is determined to be:

(980,661 acfm)(0.12)/(980,661 acfm)(1 - 0.09) = 13.2% O_2

Correcting the flow rate to standard conditions yields:

(980,661 acfm)(70 + 460/203 + 460)(1 – 0.09) = 713,383 dscfm

(10 ppmvd)(20.95 – 13.2)/(20.95 – 15) = 13 ppmvd @ 13.2% O_2

(13 ppmvd/10^6)(713,383 dscfm)(60 min/hr)(lbmol/385.3 dscf)(17 lb NH_3/lbmol)

= **24.55 lb NH_3/hr**

Based upon the maximum combined heat input for a CTG/HRSG power train of 2,012 MM BTU/hr, this mass emission rate converts to the following emission factor:

(24.55 lb NH_3/hr)/(2,012 MM BTU/hr) = **0.0122 lb NH_3/MM BTU**
= 12.2 lb NH_3/MM scf

Appendix B

Emission Calculations

This appendix delineates the assumptions underlying the emission calculations used to determine the maximum regulated air pollutant and toxic air contaminant emission rates for the Pittsburg District Energy Facility.

Annual, daily, and hourly emissions from the CTGs, HRSGs, and auxiliary boiler will be limited through a variety of permit conditions limiting mass emission rates, emission concentrations, and fuel usage rates.

Individual and combined heat input limits for the CTG, HRSG, and auxiliary boiler are given below in Table B-1 below.

Table B-1 Maximum Allowable Heat Input Rates

Source	MM BTU/hour	MM BTU/day	MM BTU/year
S-1 CTG and S-2 HRSG Combined	2,012	48,288	16,256,960[a]
S-3 CTG and S-4 HRSG Combined	2,012	48,288	16,256,960[a]
Auxiliary Boiler	266	6,384	399,000
CTGs, HRSGs, & Auxiliary Boiler Combined	4,290	102,960	32,900,000[b]

[a]based upon 8,080 hours of simultaneous gas turbine and HRSG duct burner firing per year @ 100% load

[b]limited by permit condition

The maximum nitrogen oxide, carbon monoxide, and precursor organic compound emission rates from the CTG occur during start-up and shutdown periods. The PM_{10}, sulfur dioxide, ammonia, and toxic compound emissions are a function of fuel use rate only and are not increased during start-up or shutdown periods. The start-up and shutdown emissions listed in Table B-2 were provided by the CTG vendor and are projected and not guaranteed. See sections B-1.1 and B-1.2 for detailed CTG start-up and shutdown emission calculations.

Table B-2 Maximum Start-up and Shutdown Emission Rates for each CTG (lb)

Operating Mode	NO_2	CO	POC	PM_{10}	SO_2
Start-up[a]	223	1821	239	17	5.6
Shutdown[b]	58	238	253	8.5	2.8

[a]Based upon a 1.0 hour hot start-up

[b]Based upon a 0.5 hour shutdown

Table B-3 Maximum Facility Emissions[a]

Pollutant	lb/hr[b]	lb/day[b]	ton/yr[c]
nitrogen oxides (as NO_2)	39.05	939.5	154.8
carbon monoxide	62.8	1507.8	488.1
precursor organic compounds	7.22	173.3	97.61
particulate matter (PM_{10})	35.77	858.4	123.6
sulfur dioxide	11.86	284.7	34.02

[a]includes PM_{10} emissions from cooling towers which are exempt from BAAQMD permit requirements

[b]baseload operation of each CTG and associated HRSG (excluding CTG start-up and shutdown emissions) and includes 24 hr/day operation of auxiliary boiler

[c]includes CTG start-up and shutdown emissions

B-1.0 CTG Start-Up and Shutdown Emission Rate Calculations

The following start-up emission rates are based upon data provided by Westinghouse. The duration of a turbine start-up is driven by the temperature of the steam turbine. The longer the gas turbine and steam turbine have been down, the longer it takes for the steam turbine blades and seals to be brought back up to operating temperature. Under the 2 X 1 configuration (two gas turbines and a shared steam turbine), cold starts and warm starts are very unlikely since it is anticipated that at least one turbine will be in operation at all times. According to the applicant, the 2 X 1 configuration is the most likely configuration for the PDEF. Therefore, the applicant

has opted to base annual emission estimates upon the assumption that the vast majority of turbine start-ups will be hot.

SO_2 and PM_{10} emission rates are not increased during start-up and shutdown periods. As a worst-case assumption, SO_2 and PM_{10} emission estimates are based upon baseload emission factors of 0.00845 lb PM_{10}/MM BTU and 0.00277 lb SO_2/MM BTU during start-ups and shutdowns.

Table B-4 CTG Start-Up Emissions (lb/start-up)

Pollutant	Cold Start-Up[a]	Warm Start-Up[b]	Hot Start-Up[c]
NO_x (as NO_2)	280.3	245.7	223
CO	3,393.4	2,684.4	1,821
UHC (as CH_4)	359.4	319.9	239

[a]applies when CTG/ST has not been in operation for more than 72 hours

[b]applies when CTG/ST has not been in operation for more than 8 hours but less than 72 hours

[c]applies when CTG/ST has not been in operation for less than 8 hours

Table B-5 CTG Shutdown Emissions[a] (lb/hr)

Pollutant	PDEF Original Proposed[b]	PDEF Revised[c]	SF Energy FDOC[d]	Crockett Cogeneration Source Test[e]
NO_x	14.64	116	105.4	5.2
CO	29.8	476	477.4	29.5
UHC (as CH_4)	7	506	506	2.6

[a]based upon shutdown duration of one half hour

[b]Westinghouse estimates assuming 60% load during shutdown

[c]used in emission estimates as worst-case

[d]issued October 26, 1995; assumed fuel use rate of 85% during shutdown

[e]G.E. Frame 7F turbine; testing occurred June 1997

B-1.1 START-UP EMISSION RATE CALCULATIONS:

Hot Start

- Applies when CTG has not been in operation for less than 8 hours
- During first 30 minutes, CT is ramped up to 100% RPM
- During second 30 minutes, steam turbine (ST) is ramped up to 100% RPM
- Total duration: 1 hour

NITROGEN OXIDES (as NO_2)

(a) 0.5 hours into start-up, CTG exhaust temperature has reached minimum SCR operating temperature. A conservative SCR abatement factor of 60% (wt) will apply during the second 30 minutes of the 1 hour start-up.

(b) minimum CTG NO_x emissions during first 30 minutes: **205 lbs** (per Westinghouse)

(c) maximum uncontrolled CTG NO_x emissions during second 30 minutes: **1.5 lb/min**

NO_2 = 205 lb + (30 min)(1.5 lb/min)(1 – 0.60)
= **223 lb/hot start**

CARBON MONOXIDE

(a) no CO abatement credit given for oxidation catalyst during start-up

(b) maximum uncontrolled CTG CO emissions during first 30 minutes of start-up: **1,803 lbs**

(c) maximum uncontrolled CTG CO emissions during second 30 minutes of start-up: **0.6 lb/min**

CO = 1,803 lb CO + (30 min)(0.6 lb CO/min)
= **1,821 lb/hot start**

PRECURSOR ORGANIC COMPOUNDS

(a) no POC abatement credit given for oxidation catalyst during start-up

(b) maximum POC emissions during first 30 minutes of start-up: **236 lbs**

(c) maximum POC emissions during second 30 minutes of start-up: **0.1 lb/min**

POC = 236 lb POC + (30 min)(0.1 lb POC/min)

= **239 lb/hot start**

PARTICULATE MATTER (as PM_{10})

(a) PM_{10} emissions are not increased during start-up
(b) PM_{10} emissions occur at the baseload rate of 0.00845 lb PM_{10}/MM BTU at the maximum combined rated heat input of the CTG/HRSG of 2,012 MM BTU/hr.

CTG PM_{10} emissions during a start-up are therefore:

PM_{10} = (0.00845 lb PM_{10}/MM BTU)(2,012 MM BTU/hr)(1 hr start-up)
= 17 **lb PM_{10}/ hot start**

SULFUR DIOXIDE

(a) SO_2 emissions are not increased during start-up
(b) SO_2 emissions occur at baseload rate of 0.0027 lb SO_2/MM BTU at the maximum combined rated heat input for the CTG/HRSG of 2,012 MM BTU/hr.

CTG SO_2 emissions during a start-up are therefore:

SO_2 = (0.00277 lb SO_2/MM BTU)(2,012 MM BTU/hr)(1 hr start-up)
= **5.6 lb SO_2/hot start**

Cold Start

- Applies when CTG has not been in operation for more than 72 hours
- Total Duration of cold start: 217 minutes
- During first 30 minutes, CT is ramped up to 100% RPM
- During next 20 minutes, CT is held at 25% load
- During next 52 minutes, CT is held at 50% load
- During next 30 minutes, ST is ramped up to 100% RPM

NITROGEN OXIDES (as NO_2)

(a) 0.5 hours into start-up, CTG exhaust temperature has reached minimum SCR operating temperature. SCR abatement factor of 75% (wt) will apply after 30 minutes have elapsed
(b) SCR abatement factor of 85% (wt) will apply after 40 minutes have elapsed
(c) maximum CTG NO_x emissions during first 30 minutes: **205 lbs**

(per Westinghouse)

(d) maximum uncontrolled CTG NO_x emissions during next 20 minutes:
4.2 lb/min

(e) maximum uncontrolled CTG NO_x emissions during next 127 minutes:
2.6 lb/min

(f) maximum uncontrolled CTG NO_x emissions during next 40 minutes:
1.5 lb/min

NO_2 = 205 lb + (10 min)(4.2 lb/min)(1 – 0.75) + (10 min)(4.2 lb/min)(1 – 0.85) + (127 min)(2.6 lb/min)(1 – 0.75) + (40 min)(1.5 lb/min)(1 – 0.75)
= **280.3 lb/cold start**

CARBON MONOXIDE

(a) maximum CTG CO emissions during first 30 minutes: 1,803 lbs
(b) maximum CTG CO emissions during next 20 minutes: 32.6 lb/min
(c) maximum CTG CO emissions during next 127 minutes: 7.2 lb/min
(d) maximum CTG CO emissions during next 40 minutes: 0.6 lb/min

CO = 1,803 lb + (20 min)(32.6 lb/min) + (127 min)(7.2 lb/min) + (40 min)(0.6 lb/min)
= **3,393.4 lb/cold start**

PRECURSOR ORGANIC COMPOUNDS

(a) no POC abatement credit given for oxidation catalyst during start-up

(b) maximum POC emissions during first 30 minutes of start-up:
236 lbs

(c) maximum POC emission rate during next 20 minutes of start-up:
4.7 lb/min

(d) maximum POC emission rate during next 127 minutes of start-up:
0.2 lb/min

(e) maximum POC emission rate during next 40 minutes of start-up:
0.1 lb/min

POC = 236 lb POC + (20 min)(4.7 lb POC/min) + (127 min)(0.2 lb POC/min) + (40 min)(0.1 lb POC/min)
= **359.4 lb/cold start**

PARTICULATE MATTER (as PM_{10})

(c) PM_{10} emissions are not increased during start-up
(d) PM_{10} emission rate during start-up equals baseload rate of 0.00845 lb PM_{10}/MM BTU at the maximum combined rated heat input of the CTG/HRSG of 2,012 MM BTU/hr.

CTG PM_{10} emissions during a start-up are therefore:

PM_{10} = (0.00845 lb PM_{10}/MM BTU)(2,012 MM BTU/hr)(217 min start-up)(1 hr/60 min)
= **61.5 lb PM_{10}/cold start**

SULFUR DIOXIDE

(a) SO_2 emissions are not increased during start-up
(b) SO_2 emission rate during start-up equals baseload rate of 0.0027 lb SO_2/MM BTU at the maximum combined rated heat input for the CTG/HRSG of 2,012 MM BTU/hr.

CTG SO_2 emissions during a start-up are therefore:

SO_2 = (0.00277 lb SO_2/MM BTU)(2,012 MM BTU/hr)(217 min start-up)(1 hr/60 min)
= **20.25 lb SO_2/cold start**

Warm Start

- Applies when CTG has not been in operation for more than 8 hours but less than 72 hours
- Total Duration of cold start: 127 minutes
- During first 30 minutes, CT is ramped up to 100% RPM
- During next 15 minutes, CT is held at 25% load
- During next 52 minutes, CT is held at 50% load
- During next 30 minutes, ST is ramped up to 100% RPM

NITROGEN OXIDES (as NO_2)

(a) 0.5 hours into start-up, CTG exhaust temperature has reached minimum SCR operating temperature. SCR abatement factor of 75% (wt) will apply after 30 minutes have elapsed
(b) SCR abatement factor of 85% (wt) will apply after 40 minutes have elapsed
(c) maximum CTG NO_x emissions during first 30 minutes: **205 lbs** (per Westinghouse)
(d) maximum uncontrolled CTG NO_x emission rate during next 15 minutes: **4.2 lb/min**
(e) maximum uncontrolled CTG NO_x emission rate during next 52 minutes:

2.6 lb/min

(f) maximum uncontrolled CTG NO_x emission rate during next 30 minutes:
1.5 lb/min

NO_2 = 205 lb + (10 min)(4.2 lb/min)(1 – 0.75) + (5 min)(4.2 lb/min)(1 – 0.85) + (52 min)(2.6 lb/min)(1 – 0.75) + (30 min)(1.5 lb/min)(1 – 0.75)
= **245.7 lb/warm start**

CARBON MONOXIDE

(a) maximum CTG CO emissions during first 30 minutes: 1,803 lbs
(b) maximum CTG CO emission rate during next 15 minutes: 32.6 lb/min
(c) maximum CTG CO emission rate during next 52 minutes: 7.2 lb/min
(d) maximum CTG CO emission rate during next 30 minutes: 0.6 lb/min

CO = 1,803 lb + (15 min)(32.6 lb/min) + (52 min)(7.2 lb/min) + (30 min)(0.6 lb/min)
= **2,684.4 lb/warm start**

PRECURSOR ORGANIC COMPOUNDS

(a) no POC abatement credit given for oxidation catalyst during start-up
(b) maximum POC emissions during first 30 minutes of start-up:
236 lbs
(c) maximum POC emission rate during next 15 minutes of start-up:
4.7 lb/min
(d) maximum POC emission rate during next 52 minutes of start-up:
0.2 lb/min
(e) maximum POC emission rate during next 30 minutes of start-up:
0.1 lb/min

POC = 236 lb POC + (15 min)(4.7 lb POC/min) + (52 min)(0.2 lb POC/min) + (30 min)(0.1 lb POC/min)
= **319.9 lb/warm start**

PARTICULATE MATTER (as PM_{10})

(a) PM_{10} emissions are not increased during start-up
(b) PM_{10} emission rate during start-up equals baseload rate of 0.00845 lb PM_{10}/MM BTU at the maximum combined rated heat input of the CTG/HRSG of 2,012 MM BTU/hr.

CTG PM_{10} emissions during a start-up are therefore:

PM_{10} = (0.00845 lb PM_{10}/MM BTU)(2,012 MM BTU/hr)(127 min start-up)(1 hr/60 min)
= **36 lb PM_{10}/warm start**

SULFUR DIOXIDE

(a) SO_2 emissions are not increased during start-up
(b) SO_2 emission rate during start-up equals baseload rate of 0.0027 lb SO_2/MM BTU at the maximum combined rated heat input for the CTG/HRSG of 2,012 MM BTU/hr.

CTG SO_2 emissions during a start-up are therefore:

SO_2 = (0.00277 lb SO_2/MM BTU)(2,012 MM BTU/hr)(127 min start-up)(1 hr/60 min)
= **11.8 lb SO_2/warm start**

B-1.2 SHUTDOWN EMISSION RATE CALCULATIONS:

NITROGEN OXIDES (as NO_2)

As a conservative assumption, NO_2 shutdown emissions will be based upon S.F. Energy Company FDOC emission estimates.

CARBON MONOXIDE

As a conservative assumption, CO shutdown emissions will be based upon S.F. Energy Company FDOC emission estimates.

PRECURSOR ORGANIC COMPOUNDS

As a conservative assumption, POC shutdown emissions will be based upon S.F. Energy Company FDOC emission estimates.

PARTICULATE MATTER (as PM_{10})

(a) duration of shutdown: 1/2 hour
(b) PM_{10} emissions are not increased during a shutdown and are emitted at the baseload rate of 0.00845 lb PM_{10}/MM BTU at the maximum rated heat input for the CTG of 2,012 MM BTU/hr.

CTG PM_{10} emissions during a shutdown are therefore:

(0.00845 lb PM_{10}/MM BTU)(2,012 MM BTU/hr)(1/2 hr shutdown)

= 8.5 lb PM_{10}/shutdown

SULFUR DIOXIDE

(a) duration of shutdown: 1/2 hour
(b) SO_2 emissions are not increased during a shutdown and are emitted at the baseload rate of 0.00277 lb SO_2/MM BTU at the maximum rated heat input for the CTG of 2,012 MM BTU/hr.

CTG SO_2 emissions during a shutdown are therefore:

(0.00277 lb SO_2/MM BTU)(2,012 MM BTU/hr)(1/2 hr shutdown)

= **2.8 lb SO_2/shutdown**

B-2.0 Typical Operating Scenarios and Regulated Air Pollutant Emissions for the CTGs and HRSGs

The applicant expects three typical operating modes for the CTGs and HRSGs for the PDEF. In all cases, at least one CTG and HRSG power train will be in operation at all times.

Baseload: Both CTG and HRSG power trains operating continuously at 100% load with a maximum combined heat input rate of 2,012 MM BTU/hr per power train.

Load Following: The CTGs and HRSGs would be operated in response to contractual load and spot market demand. Total heat input would be less than baseload operating mode

Partial Shutdown: Due to low demand, one CTG and HRSG power train would be shutdown at certain times of day or times of the year. The applicant has assumed a worst-case scenario of 312 hot start-ups per year that occur during long-term operation in this mode.

Regulated air pollutant emissions are calculated below for the following operating scenarios that may occur under the operating modes given above.

Regulated air pollutant emissions due to HRSG duct burner firing will have a negligible affect on total overall emissions since the heat input rates utilized in the emission calculations are based upon an ambient temperature of 50^{o}F. Duct burner firing is expected to occur on warmer days when the HHV heat input to the CTG will be lower. PDEF has agreed to comply with the emission limits based upon the assumption that HRSG duct burner firing will have negligible effect on overall emissions.

Scenario A estimates the maximum emissions that would occur under the baseload operating mode with 5% downtime for maintenance. The emission rates calculated under Scenario A and summarized in Table B-6 were used as inputs for the ambient air quality impact analysis and represent the worst-case annual emissions.

8,080 hours of baseload (100% load) operation per year for each CTG @ 50°F
156 one hour (hot) start-ups per CTG per year
156 half hour shutdowns per CTG per year

Table B-6 Worst-Case Annual Regulated Air Pollutant Emissions for CTGs and HRSGs (Scenario A)

Source (Operating Mode)	NO_2 (lb/yr)	CO (lb/yr)	POC (lb/yr)	PM_{10} (lb/yr)	SO_2 (lb/yr)
S-1 CTG (156 hot start-ups)	34,788	284,076	37,284	2,652	873.6
S-1 CTG (156 shutdowns)	9,048	37,128	39,468	1,326	436.8
S-1 CTG (8,080 hrs @ 100% load)	140,276.9[a]	205,739.4[a]	62,345.3[a]	137,360[b]	43,174.1[a]
S-3 CTG (156 hot start-ups)	34,788	284,076	37,284	2,652	873.6
S-3 CTG (156 shutdowns)	9,048	37,128	39,468	1,326	436.8
S-3 CTG (8,080 hrs @ 100% load)	140,276.9[a]	205,739.4[a]	62,345.3[a]	137,360[b]	43,174.1[a]
Total Emissions (lb/yr)	368,225.8	1,053,886.8	278,194.6	282,676	88,969
(ton/yr)	**184.1**	**526.94**	**139.1**	**141.34**	**44.5**

[a]based upon the maximum heat input rate for a CTG of 1,929 MM BTU/hr @ 50°F

[b]based upon the worst case PM_{10} emission rate of 17 lb/hr and the maximum combined heat input rate for a CTG/HRSG power train of 2,012 MM BTU/hr

Scenario B estimates the maximum emissions that would occur under the partial shutdown operating mode. The emission rates calculated under Scenario B and summarized in Table B-7 are the basis of permit condition limits and emission offset requirements. To provide maximum operational flexibility, no limitations will be imposed on the type or quantity of turbine start-ups. Instead, the facility must comply with consecutive twelve month mass limits at all times. As

shown below, the applicant has opted to base the annual emission estimates upon the assumption that the vast majority of turbine start-ups will be hot.

10,400 hours of baseload (100% load) CTG operation per year @ 50°F
3,328 hours of 60% load CTG operation per year @ 50°F
312 one hour (hot) CTG start-ups
312 half hour CTG shutdowns per year.

Table B-7 Maximum Annual Regulated Air Pollutant Emissions for CTGs and HRSGs (Scenario B)

Source (Operating Mode)	NO_2 (lb/yr)	CO (lb/yr)	POC (lb/yr)	PM_{10} (lb/yr)	SO_2 (lb/yr)
S-1 and S-3 CTGs (312 hot start-ups)	69,576	568,152	74,568	5,304	1,747.2
S-1 and S-3 CTGs (312 shutdowns)	18,096	74,256	78,936	2,652	873.6
S-1 and S-3 CTGs (10,400 hrs[a] @ 100% load)	180,554.4[b]	264,813[b]	35,572.2[b]	176,814.6[d]	55,570.6[b]
S-1 and S-3 CTGs (3,328 hrs[a] @ 60% load)	37,110.5[c]	54,428.8[c]	5,607.8[c]	56,580.6[d]	11,421.8[c]
Total Emissions (lb/yr)	305,336.9	961,649.9	194,684	241,351.2	69,613.2
(ton/yr)	**152.67**	**480.8**	**97.34**	**120.67**	**34.8**

[a]total combined firing hours for both turbines

[b]based upon the maximum heat input rate of 1,929 MM BTU/hr for each CTG

[c]based upon the maximum heat input rate of 1,239 MM BTU/hr for each CTG @ 50°F and 60% load

[d]based upon the worst case PM_{10} emission rate of 17 lb/hr at the maximum combined heat input rate of 2,012 MM BTU/hr

B-4.0 Cooling Tower Emissions

The cooling tower is exempt from District permit requirements pursuant to Regulation 2-1-128.4. It is assumed that all particulate matter will be emitted as PM_{10}.

Concentration Cycles: 3
Cooling tower circulation rate: 0.3 gpm
maximum total dissolved solids: 970 mg/l

PM_{10} = (3 cycles)(0.3 gal/min)(60 min/hr)(970 mg/l)(3.785 l/gal)(lb/453.6 g)($g/10^3$ mg)
= 0.44 lb/hr
= 10.49 lb/day (24 hr/day operation)
= 3,828.8 lb/yr (8,760 hours per year maximum operation)
= **1.91 ton/yr**

B-5.0 Auxiliary Boiler Emissions

The maximum hourly, daily, and annual regulated air pollutant emissions for S-5 Auxiliary Boiler are summarized in Table B-8.

Table B-8 Maximum Regulated Air Pollutant Emissions for Auxiliary Boiler

	NO_2	CO	POC	PM_{10}	SO_2
Emission Factor[a] (lb/MM BTU)	0.0107	0.0365	0.00137	0.005	0.0027
lb/hr[b]	2.85	9.7	0.36	1.33	0.72
lb/day[c]	68.3	233	8.75	31.9	17.2
lb/yr[d]	4,269.3	14,563.5	546.6	1,995	1,077.3
ton/yr	2.13	7.28	0.27	1	0.54

[a]NO_2 emission factor is based upon BACT specification of 9 ppmv NO_x, dry @ 3% O_2. CO emission factor is based upon BACT specification of 50 ppmv, dry @ 3 % O_2. POC, and SO_2 emission factors are from AP-42, Section 1.4, Natural Gas Combustion, Table 1.4-2. PM_{10} emission factor is from AP-42, Table 1.4-1.

[b]Based upon maximum heat input of 266 MM BTU/hr

[c]Based upon 24 hour per day operation @ 266 MM BTU/hr or 6,384 MM BTU/day

[d]Based upon a maximum 1,500 hr/yr operation and a corresponding maximum annual heat input of 399,000 MM BTU/yr

B-6.0 Maximum Toxic Air Contaminant (TAC) Emissions

The maximum toxic air contaminant emissions resulting from the combustion of natural gas at the S-1 and S-3 CTGs, S-2 and S-4 HRSGs, and S-5 Auxiliary Boiler are summarized in Table B-9. These emission rates were used as input data for the health risk assessment modeling and are based upon a maximum combined annual heat input of 32,513,920 MM BTU per year for S-1 & S-3 CTGs, S-2 & S-4 HRSGs and an annual heat input of 399,000 MM BTU per year for S-5 Auxiliary Boiler. The derivation of the emission factors is detailed in appendix A.

Table B-9
Worst-Case TAC Emissions[a] for CTGs, HRSGs, and Auxiliary Boiler

Toxic Air Contaminant	Emission Factor (lb/MM BTU)	g/sec	lb/yr
Acetaldehyde[d]	6.86E-05	3.26E-02	2,266
Acrolein	2.37E-05	1.1E-02	768
Ammonia[b,c]	1.22E-02	5.7	396,670
Benzene[d]	1.36E-05	6.18E-03	430
1,3-Butadiene[c,d]	1.27E-07	5.9E-05	4.1
Ethylbenzene	1.79E-05	8.38E-03	582.5
Formaldehyde[d]	1.10E-04	5.24E-02	3,643.4
Hexane	2.59E-04	1.21E-01	8,428
Napthalene	1.66E-06	7.81E-04	54.3
PAHs[d]	2.32E-06	1.08E-03	75.3
Propylene	7.70E-04	3.61E-01	25,110
Propylene Oxide[c,d]	4.78E-05	2.21E-02	1,535.2
Toluene	7.10E-05	3.37E-02	2,346.3
Xylene	2.61E-05	1.28E-02	891

[a]combined emissions from S-1 & S-3 CTGs, S-2 & S-4 HRSGs, and S-5 Auxiliary Boiler

[b]based upon the worst-case ammonia slip from the SCR system of 10 ppmvd @ 15% O_2 and 8,080 hours of operation per CTG at 100% load

[c]emitted from CTGs only, not from auxiliary boiler

[d]carcinogenic compounds

Table B-10
Worst-Case TAC Emissions for Cooling Towers[a]

Toxic Air Contaminant	Emission Factor (lb/hr)	Emission Rate (lb/yr)	Risk Screening Trigger Level (lb/yr)
Aluminum	4.5E-05	0.39	N/S[b]
Arsenic[c]	1.8E-06	0.016	0.024
Silver	2.3E-06	0.02	N/S
Barium	5.4E-06	0.05	N/S
Beryllium[c]	4.5E-06	**0.04**	**0.015**
Cadmium[c]	4.5E-06	0.04	0.046
Chloride	0.1027	900	N/S
Hexavalent chromium[c]	2.3E-06	**0.02**	**0.0014**
Copper	3.2E-06	0.028	463
Fluoride	3.2E-04	2.8	N/S
Lead[c]	9.9E-06	0.087	29
Magnesium	1.2E-02	105	N/S
Manganese	6.1E-05	0.53	77
Mercury	9.1E-08	0.0008	57.9
Selenium[c]	3.2E-06	0.028	96.5
Silica[c]	1.2E-05	0.11	N/S
Sodium hydroxide	3.2E-06	0.028	926
Sulfate	8.8E-02	771	N/S
Zinc	5.6E-06	0.05	6,760

[a]based upon 24 hr/day, 365 day/yr operation of cooling towers at maximum flow rate

[b]none specified

[c]carcinogenic compound

B-7.0 Maximum Facility Emissions

The maximum annual permitted facility regulated air pollutant emissions are shown in Table B-11. These emissions occur under operating scenario B with a total of 312 hot start-ups and 312 shutdowns per year for both turbines combined. The total permitted facility emissions shown are the basis of permit condition limits and emission offset requirements.

Table B-11 Maximum Annual Facility Emissions[a] (ton/yr)

Source	NO_2	CO	POC	PM_{10}	SO_2
S-1 CTG and S-2 HRSG[a]	76.33	240.41	48.67	60.34	16.74
S-3 CTG and S-4 HRSG[a]	76.33	240.41	48.67	60.34	16.74
S-5 Auxiliary Boiler	2.13	7.28	0.27	1	0.54
Total Permitted Emissions	**154.8**	**488.1**	**97.61**	**121.67**	**34.02**
Cooling Towers[b]	0	0	0	1.91	0
Total Facility Emissions	**154.8**	**488.1**	**97.61**	**123.6**	**34.02**

[a]Includes CTG start-up and shutdown emissions

[b]Exempt from BAAQMD permit requirements per Regulation 2-1-128.4.

Table B-12 summarizes the worst-case annual facility emissions that were used as inputs under the air quality impact analysis.

Table B-12 Worst-Case Annual Facility Emissions[a] (ton/yr)

Source	NO_2	CO	POC	PM_{10}	SO_2
S-1 CTG and S-2 HRSG[a]	92.05	263.47	69.55	70.67	22.25
S-3 CTG and S-4 HRSG[a]	92.05	263.47	69.55	70.67	22.25
S-5 Auxiliary Boiler	2.13	7.28	0.27	1	0.54
Total Emissions	**186.23**	**534.22**	**139.37**	**142.34**	**45.04**
Cooling Towers[b]	0	0	0	1.91	0
Total Facility Emissions	**186.23**	**534.22**	**139.37**	**144.25**	**45.04**

[a]Includes CTG start-up and shutdown emissions

[b]Exempt from BAAQMD permit requirements per Regulation 2-1-128.4.

The maximum hourly and daily regulated air pollutant emission rates by source for baseload operation (excluding CTG start-ups and shutdowns) are summarized in Table B-13.

Table B-13 Maximum Hourly and Daily Baseload Regulated Air Pollutant Emission Rates

(Excluding CTG Start-up and Shutdown Emissions)

	NO_2	CO	POC	PM_{10}	SO_2
S-1 CTG and S-2 HRSG Combined[a]					
lb/hr	18.1	26.55	3.43	17	5.57
lb/day	435.6	637.4	82.32	408	133.76
S-3 CTG and S-4 HRSG Combined[a]					
lb/hr	18.1	26.55	3.43	17	5.57
lb/day	435.6	637.4	82.32	408	133.76
S-5 Auxiliary Boiler					
lb/hr	2.85	9.7	0.36	1.33	0.72
lb/day	68.3	233	8.75	31.9	17.2

[a]Based upon a maximum combined heat input rate for each CTG and associated HRSG of 2,012 MM BTU/hr and 24 hr/day operation

The maximum daily regulated air pollutant emissions per source including CTG start-up and shutdown emissions are shown in Table B-14.

Table B-14 Maximum Daily Regulated Air Pollutant Emissions By Source (lb/day)

	NO_2[c]	CO	POC	PM_{10}	SO_2
S-1 CTG & S-2 HRSG[a]	688.4	2,656.5	551.17	408	133.76
S-3 CTG & S-4 HRSG[a]	688.4	2,656.5	551.17	408	133.76
S-5 Auxiliary Boiler[b]	68.3	233	8.75	31.9	17.2

[a]based upon one 1 hour hot startup, 22.5 hours of full load operation @ 2,012 MM BTU/hr, and one 0.5 hour shutdown in one day. For example, NO_x emissions are calculated as follows:

223 lb/SU + 58 lb/SD + (2,012 MM BTU/hr)(0.009 lb NO_x/MM BTU)(22.5 hr/day)
= 688.4 lb NO_x/day

[b]based upon 24 hour/day operation of the Auxiliary Boiler at its maximum rated heat input of 266 MM BTU/hr

Table B-15 summarizes the worst-case daily regulated air pollutant emissions from permitted sources for the purposes of the air quality impact analysis. The total emission rates shown were used to model the emission concentrations for compliance with the 24-hour ambient air quality standards for PM_{10} and SO_2. Because the turbine PM_{10} and SO_2 emission rates are a function of fuel use only, and start-up and shutdown emission rates are based upon the worst-case assumption of full load fuel usage, the worst-case 8-hour SO_2 and PM_{10} emission rates are independent of start-up type.

Table B-15
Worst-Case Regulated Air Pollutant Emissions over a 24-hour Period (lb)

	NO_2[e]	CO	POC	PM_{10}	SO_2
S-1 CTG Hot Start-up	223	1821	239	17	5.6
S-1 CTG & S-2 HRSG Baseload Operation[a]	407.4	597.5	181.1	382.5	125.4
S-3 CTG Hot Start-up[b]	223	1821	239	17	5.6
S-3 CTG & S-4 HRSG Baseload Operation[c]	416.5	610.8	185.1	391	128.2
S-5 Auxiliary Boiler[d]	68.3	233	8.75	31.9	17.2
S-1 CTG Shutdown	58	238	253	8.5	2.8
Total	**1396.2**	**5321.3**	**1105.95**	**847.9**	**284.8**

[a]based upon 22.5 hours baseload operation at maximum combined heat input of 2,012 MM BTU/hr

[b]occurs in second hour of 24-hr period

[c]based upon 23 hours baseload operation at maximum combined heat input of 2,012 MM BTU/hr

[d]based upon 24 hour operation at maximum rated heat input of 266 MM BTU/hr

[e]as NO_2

Table B-16 summarizes the worst-case 8-hour regulated air pollutant emissions from permitted sources for the purposes of the air quality impact analysis. The total emission rates shown were used to model the emission concentrations for compliance with the 8-hour ambient air quality standards for CO, SO_2, and NO_2. Based upon a screening impact analysis of turbine emission rates and stack characteristics, it was determined that the worst-case impacts for CO and NO_2 over an 8-hour averaging period occur under hot start-up mode at an ambient temperature of 30^oF. Because SO_2 emission rates are a function of fuel use only, and start-up and shutdown emission rates are based upon full load fuel usage, the worst-case 8-hour SO_2 emission rate is independent of start-up type.

Table B-16 Worst-Case Regulated Air Pollutant Emissions over an 8-hour Period (lb)

	NO_2	CO	POC	PM_{10}	SO_2
S-1 CTG Hot Start-up	223	1821	239	17	5.6
S-1 CTG & S-2 HRSG Baseload Operation[a]	126.75	185.9	56.3	119	39
S-3 CTG Hot Start-up[b]	223	1821	239	17	5.6
S-3 CTG & S-4 HRSG Baseload Operation[c]	108.64	159.35	48.3	102	33.44
S-5 Auxiliary Boiler[d]	22.77	77.67	2.92	10.6	5.73
Total	**681.4**	**4064.9**	**585.5**	**265.6**	**89.37**

[a]based upon 7 hours of baseload operation at maximum combined heat input of 2,012 MM BTU/hr

[b]occurs in second hour of 8-hour period

[c]based upon 6 hours of baseload operation at maximum combined heat input of 2,012 MM BTU/hr

[d]based upon 8-hour operation at maximum heat input rate of 266 MM BTU/hr

Table B-17 summarizes the worst-case 1-hour regulated air pollutant emissions from permitted sources for the purposes of the air quality impact analysis. The total emission rates shown were used to model the emission concentrations for compliance with the 1-hour ambient air quality standards for CO, SO_2, and NO_2. Based upon a screening impact analysis of turbine emission rates and stack characteristics, it was determined that the worst-case impacts for CO and NO_2 over a 1-hour period occur when one turbine is in cold start-up mode while a second operates at 100% load at an ambient temperature of 30°F. Because SO_2 emission rates are a function of fuel use only, and start-up and shutdown emission rates are based upon full load fuel usage, the worst-case 1-hour SO_2 emission rate is independent of start-up type.

Table B-17 Worst-Case Regulated Air Pollutant Emissions over a 1-hour Period (lb)

	NO_2	CO	POC	PM_{10}	SO_2
S-1 CTG Cold Start-up[a]	225.7	2,527	274.4	17	5.6
S-3 CTG & S-4 HRSG Baseload Operation[b]	18.1	26.56	8.05	17	5.6
S-5 Auxiliary Boiler[c]	22.77	77.67	2.92	10.6	5.73
Total	**266.6**	**2,631.2**	**285.4**	**44.6**	**16.93**

[a]based upon first hour of 217 minute cold start as estimated by Westinghouse

[b]based upon 1 hour of baseload operation at maximum combined heat input of 2,012 MM BTU/hr

[c]based upon 1 hour operation at maximum heat input rate of 266 MM BTU/hr

B-8.0 Maximum Facility Emissions During Commissioning Period

Table B-18 summarizes the worst-case 1-hour and 8-hour emission rates for the PDEF during the commissioning period, when the oxidation catalysts and SCR systems will not be installed and operational. These emission rates were used as inputs in air quality impact models that were used to determine if the PDEF would contribute to an exceedance of the 1-hour State NO_2 ambient air quality standard, the 1-hour State and Federal NO_2 and CO standards, and the 8-hour Federal CO standard during the commissioning period.

Table B-18
Worst-Case Short-Term NO_2 and CO Emissions from CTGs during Commissioning Period (lb)

	NO_2		CO	
1-hour Emission Rates[a]	lb/hr	g/s	lb/hr	g/s
S-1 CTG	315	39.7	2,527	318.4
S-3 CTG	315	39.7	2,527	318.4
8-hour Emission Rates[b]				
S-1 CTG & S-2 HRSG	N/A	N/A	490.5	61.8
S-3 CTG & S-4 HRSG	N/A	N/A	490.5	61.8

[a]based upon simultaneous, unabated cold start of CTGs

[b]based upon simultaneous, unabated cold start of CTGs, followed by 100% load, unabated operation of CTGs and HRSGs at maximum combined heat input rate of 2,012 MM BTU/hr

Worst-Case 1-hour Emission Rates

Assumes unabated cold start of CTG

- Total Duration of cold start: 217 minutes
- During first 30 minutes, CT is ramped up to 100% RPM
- During next 20 minutes, CT is held at 25% load
- During next 52 minutes, CT is held at 50% load
- During next 30 minutes, ST is ramped up to 100% RPM

NITROGEN OXIDES (as NO_2)

The following CTG Cold Start-up emission rates are from Westinghouse

maximum NO_x emissions during first 30 minutes: 205 lbs
maximum uncontrolled NO_x emissions during next 20 minutes: 4.2 lb/min
maximum uncontrolled NO_x emissions during next 127 minutes: 2.6 lb/min
maximum uncontrolled NO_x emissions during next 40 minutes: 1.5 lb/min

NO_2 = 205 lb + (20 min)(4.2 lb/min) + (10 min)(2.6 lb/min)
= **315 lb/hr**

CARBON MONOXIDE

maximum CTG CO emissions during first 30 minutes:	1,803 lbs
maximum CTG CO emissions during next 20 minutes:	32.6 lb/min
maximum CTG CO emissions during next 127 minutes:	7.2 lb/min
maximum CTG CO emissions during next 40 minutes:	0.6 lb/min

CO = 1,803 lb + (20 min)(32.6 lb/min) + (10 min)(7.2 lb/min)
= **2,527 lb/hr**

Worst-Case 8-hour CO Emission Rate

Assumes unabated cold start of CTG, followed by 100% load, unabated operation of CTGs and HRSGs at maximum combined heat input rate of 2,012 MM BTU/hr

- Total Duration of cold start: 217 minutes
- During first 30 minutes, CT is ramped up to 100% RPM
- During next 20 minutes, CT is held at 25% load
- During next 52 minutes, CT is held at 50% load
- During next 30 minutes, ST is ramped up to 100% RPM

CARBON MONOXIDE

Cold Start-up Emission Rates:

maximum CTG CO emissions during first 30 minutes:	1,803 lbs
maximum CTG CO emissions during next 20 minutes:	32.6 lb/min
maximum CTG CO emissions during next 127 minutes:	7.2 lb/min
maximum CTG CO emissions during next 40 minutes:	0.6 lb/min

combined CO emission rate from CTG/HRSG at maximum combined heat input rate of 2,012 MM BTU/hr: 106 lb/hr

CO = 1,803 lb + (20 min)(32.6 lb/min) + (127min)(7.2 lb/min) + (40 min)(0.6 lb/min) (263 min)(hr/60 min)(106 lb/hr)
= **3,858 lb/8-hr period**
= 482.25 lb/hr
= 60.75 g/s

The applicant used a higher emission rate of **490.5 lb/hr** or **61.8 g/s**.

Appendix C

Emission Offsets

Pursuant to District Regulation 2, Rule 2, Section 302, offsets are required only for permitted sources. Therefore, emission offsets will be required for the POC, NO_x, and PM_{10} emission increases associated with S-1 CTG, S-2 HRSG, S-3 CTG, S-4 HRSG, and S-5 Auxiliary Boiler only. Emission offsets will not be required for the PM_{10} emissions attributed to the exempt cooling towers.

As of the date of this FDOC, a portion of emission reduction credits (ERCs) to be provided by the applicant have not been officially banked since they have not cleared the 30-day public review and comment period. However, we expect that the ERCs will be banked and issued. In accordance with current District policy, the applicant must demonstrate control of valid ERCs through options contracts or equivalent binding legal documents prior to the issuance of the Authority to Construct for the facility and must provide the actual banking certificates prior to the issuance of the permit to operate. Pursuant to District Regulation 2-3-405, the District will issue the Authority to Construct after the CEC certifies the PDEF.

Table C-1 Emission Offset Summary

	NO_x	CO	POC	PM_{10}	SO_2
Calculated Facility Emissions[a] (ton/yr)	154.8	488.1	97.61	121.91	34.02
Facility Permit Limits (ton/yr)	153.2	487.5	97.61	123.55	39.86
Offsets Required	Yes	No	Yes	Yes	No
Offset Ratio	1.15:1.0[b]	N/A	1.15:1.0[b]	1.0:1.0	N/A
Offsets Required (tons)	**177[c]**	**0**	**112.25**	**123.55[d]**	**0**

[a]sum of S-1 CTG, S-2 HRSG, S-3 CTG, S-4 HRSG, and S-5 Auxiliary Boiler emissions

[b]Pursuant to District Regulation 2-2-302, the applicant must provide emission offsets at a ratio of 1.15 to 1.0 since the proposed facility NO_x and POC emissions from permitted sources will each exceed 50 tons per year

[c]currently, PDEF is proposing to provide 177 tons of NO_x offsets

[d]currently, PDEF is proposing to provide 124 tons of PM_{10} offsets; 25.87 tons of the PM_{10} increase will be offset with SO_2 offsets at a ratio of 4:1 (103.5 tons of SO_2) pursuant to District

Regulation 2-2-303.1. The balance of 98.13 tons per year will be offset directly with PM_{10} ERCs

Appendix D

Health Risk Assessment

As a result of the combustion of natural gas at the CTGs, HRSGs, and auxiliary boiler and the use of water treatment chemicals at the cooling towers, the proposed Pittsburg District Energy Facility will emit the toxic air contaminants summarized in Table 2, "Maximum Facility Toxic Air Comtaminant (TAC) Emissions". In accordance with the requirements of CEQA, the BAAQMD Risk Management Policy, and CAPCOA guidelines, the impact on public health due to the emission of these compounds was assessed utilizing the air pollutant dispersion model ISCST3 and the multi-pathway cancer risk and hazard index model ACE.

The public health impact of the carcinogenic compound emissions is quantified through the increased carcinogenic risk to the maximally exposed individual (MEI). A multi-pathway risk assessment was conducted that included both inhalation and noninhalation pathways of exposure, including the mother's milk pathway. Per the BAAQMD Risk Management Policy, a project which results in an increased cancer risk to the MEI of less than one in one million is considered to be not significant and is therefore acceptable.

The public health impact of the noncarcinogenic compound emissions is quantified through the acute and chronic hazard indices which is the ratio of the expected concentration of a compound to the acceptable concentration of the compound. When more than one toxic compound is emitted, the hazard indices of the compounds are summed to give the total hazard index. The acute hazard index quantifies the magnitude of the adverse health affects caused by a brief (no more than 24 hours) exposure to a chemical or group of chemicals. The chronic hazard index quantifies the magnitude of the adverse health affects from prolonged exposure to a chemical caused by the accumulation of the chemical in the human body. Per the BAAQMD Risk Management Policy, a project with a total hazard index of 1.0 or less is considered to be not significant and the resulting impact on public health is deemed acceptable.

The results of the health risk assessment performed by the Pittsburg District Energy Facility are summarized in Table D-1.

Table D-1
Health Risk Assessment Results

Multi-pathway Carcinogenic Risk (risk in one million)	Noncarcinogenic Chronic Hazard Index	Noncarcinogenic Acute Hazard Index
0.5	0.018	0.042

In accordance with the BAAQMD Risk Management Policy, the increased carcinogenic risk and acute and chronic hazard indices attributed to this project are considered to be not significant since they are each less than 1.0. Therefore, the PDEF project is deemed to be in compliance with the BAAQMD Risk Management Policy.

Appendix E

SUMMARY OF AIR QUALITY IMPACT ANALYSIS FOR THE PITTSBURG DISTRICT ENERGY FACILITY

BACKGROUND

Enron Capital and Trade Resources Corporation has submitted a permit application (# 18595) for a proposed 500-MW combined cycle power plant, the Pittsburg District Energy Facility. The facility is to be composed of two natural gas-fired turbines, each with a heat recovery steam generator and steam turbine generator. An auxiliary natural gas fired boiler will be used as backup steam source. The proposed project will result in an increase in air pollutant emissions of NO_2, CO, PM_{10} and SO_2 triggering regulatory requirements for an air quality impact analysis.

AIR QUALITY IMPACT ANALYSIS REQUIREMENTS

Requirements for air quality impact analysis are given in the District's New Source Review (NSR) Rule: Regulation 2, Rule 2.

The criteria pollutant annual worst case emission increases for the Project are listed in Table E-1, along with the corresponding significant emission rates for air quality impact analysis.

Table E-1
Comparison of Proposed Project's Annual Worst Case Emissions
to Significant Emission Rates for Air Quality Impact Analysis

Pollutant	Proposed Project's Emissions (tons/year)	Significant Emission Rate (tons/year) (Reg-2-2-304 to 2-2-306)
NO_x (as NO_2)	183	100
CO	530	100
PM_{10}	144	100
SO_2	44.5	100

Table E-1 indicates that the proposed project emissions exceed the significant emission levels for nitrogen oxides (NO_x), carbon monoxide (CO), and fine particulate matter (PM_{10}), The

detailed requirements for air quality impact analysis for these pollutants are given in Sections 304, 305 and 306 of the District's NSR Rule.

The District's NSR Rule also contains requirements for certain additional impact analyses associated with air pollutant emissions. An applicant for a permit that requires an air quality impact analysis must also, according to Section 417 of the NSR Rule, provide an analysis of the impact of the source and source-related growth on visibility, soils and vegetation.

AIR QUALITY IMPACT ANALYSIS SUMMARY

The required contents of an air quality impact analysis are specified in Section 414 of Regulation 2 Rule 2. According to subsection 414.1, if the maximum air quality impacts of a new or modified stationary source do not exceed significance levels for air quality impacts, as defined in Section 2-2-233, no further analysis is required. (Consistent with EPA regulations, it is assumed that emission increases will not interfere with the attainment or maintenance of AAQS, or cause an exceedance of a PSD increment if the resulting maximum air quality impacts are less than specified significance levels). If the maximum impact for a particular pollutant is predicted to exceed the significance level for air quality impacts, a full impact analysis is required involving estimation of background pollutant concentrations and, if applicable, a PSD increment consumption analysis.

Air Quality Modeling Methodology

Maximum ambient concentrations of NO_x, CO and PM_{10} were estimated for various plume dispersion scenarios using established modeling procedures. The plume dispersion scenarios addressed include simple terrain impacts (for receptors located below stack height), complex terrain impacts (for receptors located at or above stack height), impacts due to building downwash, and impacts due to inversion breakup and shoreline fumigation.

Emissions from the turbines will be exhausted from two 150 foot exhaust stacks. Emissions from the auxiliary boiler are exhausted through a 100 foot stack. The project also includes a cooling tower (comprised of 6 cells) with a release height of 44 feet. Because the facility will be dispatchable, the worst case emission rates varied with each averaging period. Table E-2 contains the emission rates used in each of the modeling scenarios: turbine commissioning, start-up, maximum 1-hour, maximum 8-hour, maximum 24-hour, and maximum annual average. Commissioning is the original startup of the turbines and only occurs during the initial operation of the equipment after installation. The 1-hour NO_x and CO emissions are based on simultaneous cold startup of both turbines with no controls. The 8-hour CO emissions are based on simultaneous cold start-up over a 3-hour period with the remainder of the 5-hour period at 100 percent load with no controls. Start-up is the beginning of any of the subsequent duty cycles to bring the facility from idle status up to power production

The applicant used the EPA models SCREEN3 and ISCST3. Because the exhaust stacks are less than Good Engineering Practice (GEP) stack height, ambient impacts due to building downwash were evaluated. Because complex terrain was located nearby, complex terrain impacts were considered. Inversion breakup fumigation was evaluated using the SCREEN3 model. Shoreline Fumigation was evaluated using Screen3 and the Offshore Coastal Dispersion (OCD) model.

Air Quality Modeling Results

The maximum predicted ambient impacts of the various modeling procedures described above are summarized in Table E-3 for the averaging periods for which AAQS and PSD increments have been set. Shown in Figure 1 are the locations of the maximum modeled impacts.

Also shown in Table E-3 are the corresponding significant ambient impact levels listed in Section 233 of the District's NSR Rule. In accordance with Regulation 2-2-414, no further analysis is required for the PM_{10} modeled impacts. However, the 1-hour NO_2 and 1-hour CO modeled impacts based upon commissioning emission rates and shoreline fumigation conditions are both over the significant air quality impact level requiring further analyses. The 1-hour NO_2 and 1-hour CO modeled impacts are then added to the background concentrations for those pollutants to determine if any ambient air quality standard will be violated. See Table E-5 for pollutant background concentrations and Table E-6 for a comparison of total project impacts with applicable ambient air quality standards.

Table E-2
Averaging Period Emission Rates Used in Modeling Analysis (g/s)

Pollutant Source	Max (1-hour)	Commissioning[1]		Start-up[2] (1-hour)	Maximum (8-hour)	Maximum (24-hour)	Maximum Annual Average
		(1-hour)	(8-hour)				
NO_2							
Turbine 1	2.20	39.7	n/a	28.4	n/a	n/a	2.61
Turbine 2	2.20	39.7		2.21			2.61
Boiler	0.367			0.367			0.0628
CO							
Turbine 1	3.20	318	61.8	318	55.4	n/a	n/a
Turbine 2	3.20	318	61.8	3.20	54.2		
Boiler	1.23			1.23	1.23		
PM_{10}							
Turbine 1	n/a	n/a	n/a	n/a	n/a	2.15	2.04
Turbine 2						2.15	2.04
Cooling Tower						0.0554	0.0483
Boiler						0.163	0.0278

[1] Commissioning is the original startup of the turbines and only occurs during the initial operation of the equipment after installation. The 1-hour NO_x and CO emissions are based on simultaneous cold start-up of both turbines with no controls. The 8-hour CO emissions are based on simultaneous cold start-up over a 3-hour period with the remainder of the 5-hour period at 100 percent load with no controls. [2]Start-up is the beginning of any of the subsequent duty cycles to bring the facility from idle status up to power production.

Table E-3
Maximum Predicted Ambient Impacts of Proposed Project ($\mu g/m^3$)
[Overall maximum in bold type]

Pollutant	Averaging Time	Commissioning Maximum Impact	Maximum Modeled Impact	Shoreline Fumigation Impact	Significant Air Quality Impact Level
NO_2	1-hour	**288**	119	215	19
	annual	-	**0.16**	-	1.0
CO	1-hour	2492	1251	**3421**	2000
	8-hour	238	214	**417**	500
PM_{10}	24-hour	-	**2.9**	2.4	5
	annual	-	**0.35**	-	1

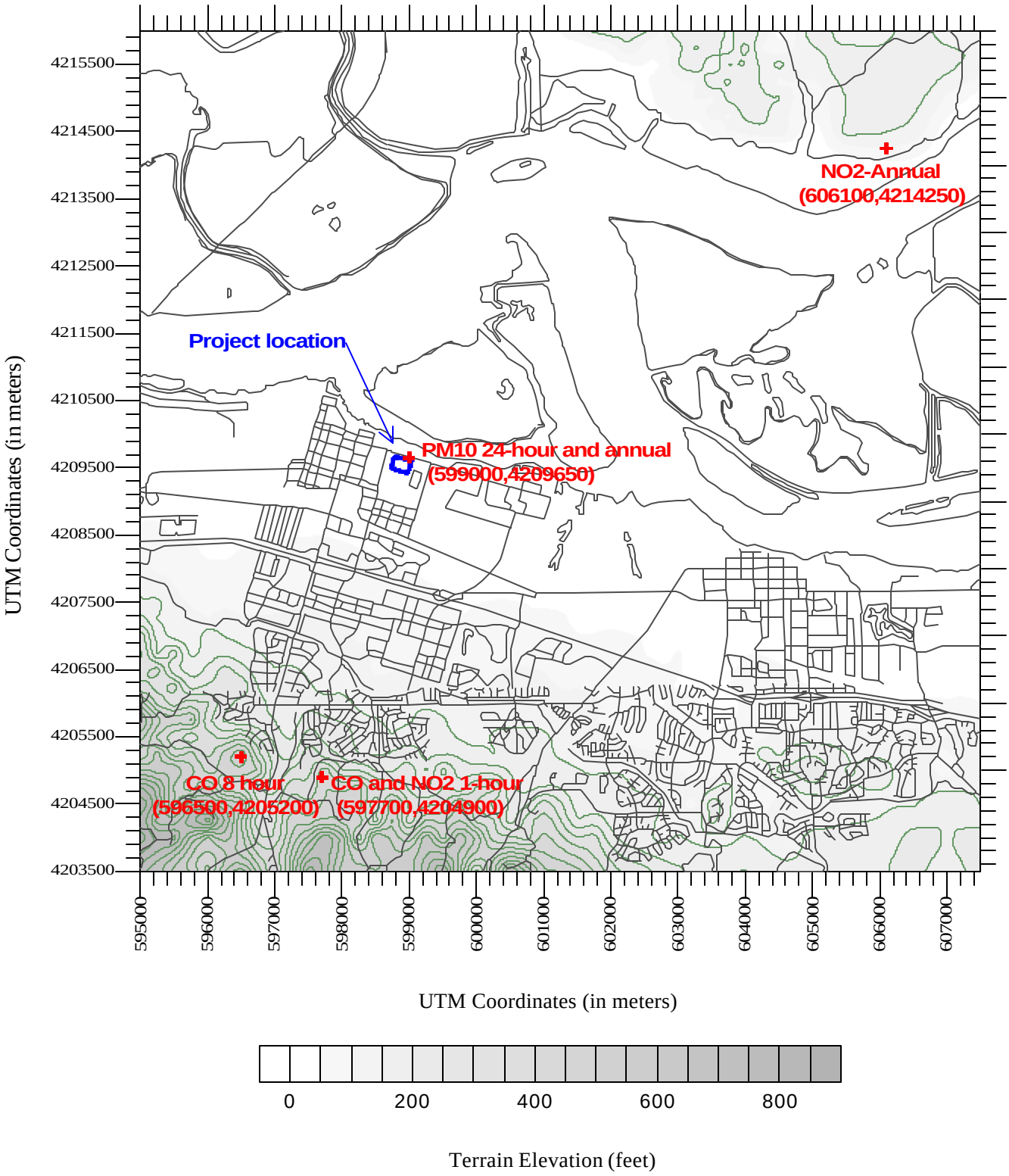

Figure 1. Location of project maximum impacts.

Background Air Quality Levels

Regulation 2-2-111 of the NSR rule entitled PSD monitoring exemption, exempts an applicant from the requirement of monitoring background concentrations in the impact area (section 414.3) provided the impacts from the proposed project are less than specified levels. Table E-4 lists the applicable exemption standards and the maximum impacts from the proposed facility. As shown, all modeled impacts are below the preconstruction monitoring threshold.

Table E-4
PSD Monitoring Exemption Levels and Maximum Impacts from the Proposed Project for NO_2 and CO ($\mu g/m^3$)

Pollutant	Averaging Time	Exemption Level	Maximum Impacts from Proposed Project
NO_2	Annual	14	0.16
CO	8-hour	575	417

Three District operated monitoring stations, Pittsburg, Concord, and Bethel Island were chosen as representative of the background NO_2, and CO concentrations. Table E-5 contains the concentrations measured at the three sites for the past 3 years.

Table E-5
Background NO_2, and CO Concentrations ($\mu g/m^3$) at Pittsburg, Concord and Bethel Island Monitoring Sites for the Past Three Years (maximums are outlined)

	NO_2		CO	
Monitor	Highest 1-hour average	Annual average	Highest 1-hour average	Highest 8-hour average
Pittsburg				
1995	150.4	32.0	7000	3267
1996	131.6	30.1	8167	3383
1997	131.5	26.3	7000	3850
Concord				
1995	169.2	37.6	7000	3267
1996	150.4	33.8	7000	3383
1997	150.4	32.0	7000	3617
Bethel Island				
1995	112.8	20.7	3500	2217
1996	112.8	20.7	3500	1750
1997	94.0	20.7	2333	1983

Table E-6 contains the comparison of the ambient standards with the proposed project impacts added to the maximum background concentrations. National and California ambient NO_2 and CO standards are not exceeded from the proposed project. Therefore, in accordance with subsection 414.1, only a visibility, soils and vegetation impact analysis is further required.

Table E-6
California and National Ambient Air Quality Standards and
Ambient Air Quality Levels from the Proposed Project ($\mu g/m^3$)

Pollutant	Averaging Time	Maximum Background	Maximum Project Impact	Maximum Project Impact Plus Maximum Background	California Standards	National Standards
NO_2	1-hour annual	169 37.6	288 0.16	457 38	470 ---	--- 100
CO	1-hour 8-hour	8167 3850	3421 417	11,588 4,267	23,000 10,000	40,000 10,000

VISIBILITY, SOILS AND VEGETATION IMPACT ANALYSIS

Visibility impacts were assessed using EPA's VISCREEN visibility screening model. The analysis shows that the proposed project will not cause any impairment of visibility at Point Reyes, the nearest Class I area.

Vegetation and soils in the project study area were inventoried. Maximum project NO_2, CO and PM_{10} concentrations will not result in significant soil and/or vegetation impacts.

CONCLUSIONS

The results of the air quality impact analysis indicate that the proposed project would not interfere with the attainment or maintenance of applicable AAQS for NO_2, CO and PM_{10}. The applicant's analysis was based on EPA approved models and calculation procedures and was performed in accordance with Section 414 of the District's NSR Rule.